Proceedings of the 3rd ParaTB Forum

4 February 2012
Sydney, Australia
Convened by
The ParaTB Forum is an initiative of the International Dairy Federation (IDF), with the first Forum held in Shanghai in 2006. The second Forum in Minneapolis in 2009 discussed monitoring success in existing programs. This meeting, the 3rd ParaTB Forum, has been convened in conjunction with the 11th International Colloquium on Paratuberculosis, to be held at the University of Sydney, Australia, in February 2012. The theme of the meeting is: Lessons learned: “Which strategies work, and which have failed?”

The Forum provides an opportunity for people involved in the coordination and management of national and regional Johne’s disease programs to engage in a frank and open discussion about methods used, progress towards program objectives, and lessons learnt.

This publication contains 14 papers, most of which are being presented by program representatives on the day; a few others are included for your information.

Animal Health Australia wishes to acknowledge Dr David Kennedy, Technical Adviser to the National Johne’s Disease Control Program, for his effort and enthusiasm in organising and convening this meeting and Kelly Wall, Project Officer, Animal Health Australia for compiling the papers. Thanks also to The Women’s College, Carillon Avenue, University of Sydney for hosting the meeting.

The papers provided for this forum are the work of the individual authors and have not been peer-reviewed. They are reprinted as provided by the authors with exception of some typographical formatting. Animal Health Australia has reprinted the papers for the sole purpose of the ParaTB Forum and takes no responsibility for copyright issues pertaining to the content. All responsibility for meeting copyright infringement rules and regulations for material appearing in these proceedings rests solely with the authors of each paper.
# Program

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3rd Paratuberculosis Forum
9.00am to 4.30pm Saturday, 4 February 2012
Menzies Room, The Women’s College, Carillon Avenue, University of Sydney

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Lessons learned on control of paratuberculosis in Denmark

Kaspar Krogh¹, and Søren S. Nielsen²

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²University of Copenhagen, Frederiksberg, Copenhagen, Denmark

INTRODUCTION

Paratuberculosis has likely been present in Denmark since the 1880′ies (Bang, 1909). However, reliable historical prevalence estimates are not available, partly because of poor diagnostic tests, reporting has been based on clinical disease rather than infection, and farmers have been unwilling to inform the true infection status of herds and animals.

Early control efforts were based on culture-based testing and, to some extent, use of vaccination. Vaccination could only be used if permission had been obtained from the veterinary authorities. To achieve permission, a farmer had to supplement with changes in management to reduce transmission of *Mycobacterium avium* subsp. *paratuberculosis* (MAP).

Vaccination was banned from 1 January 2008. Culture-based testing was also used to some extent in the 1970′ies and 1980′ies (Flensburg and Munck, 1980). However, because culture-based methods were time-consuming and considered expensive, they were never implemented on a larger scale. Testing based on culture should always be supplemented with changes in management, if the programmes should be subsidised from the cattle health insurance schemes. Due to the major costs associated with testing and lack of success, subsidised programmes were abandoned in 2005.

During the 1990′ies, limited efforts were done to control paratuberculosis. However, research projects from 1999 and onwards led to an increased awareness of infection status in many herds, along with novel ways of testing and management of MAP infections. During this period of time, stigmatisation associated with MAP infections appeared to decrease significantly in the country. Consequently, farmers demanded the initiation of a voluntary programme, which was implemented in 2006 (Nielsen et al., 2007). Participation in this programme was by mid 2011 ~ 29% of Danish dairy herds and 40% of dairy cows. Average herd size in herds participating in the control programme was higher (~170 cows) than the average dairy herd (~150 cows).

Within individual herds, the programme is largely based on separation of cows in the herd into groups with different potential for infectiousness. Cows are divided into risk groups based on quarterly examined milk samples taken from all lactating cows in the herds and examined for antibodies (milk ELISA). Implementation of different management procedures that focus upon reducing risk of transmission from cows with a known high infectiousness to calves and young stock is based on risk assessments in the individual herds.

The programme thus had a major focus on within-herd transmission, whereas the only recommendation on between-herd transmission was to avoid purchase of livestock.
IDENTIFIED FARMERS’ NEEDS

A survey carried out in 2009 suggested that reasons for participation varied (Nielsen, 2011). The 1,013 responding farmers specified the following reasons for participation: Control to increase animal health (91%); certify “freedom of MAP-infection” within 4-10 years (87%); control to avoid production losses associated with MAP infections (86%); control to increase consumer safety (64%); certification for sale of livestock (58%); control following production losses (48%).

Weighting of responses were not included, so the relative importance of the different reasons could not be assessed. However, the majority of farmers indicated that animal health and potential reduction in production losses were the most frequent reasons, and a number of farmers would be keen to also have a certification programme added to the control scheme. The variation in responses emphasise that many farmers may have different purposes of participation, and these differences needs to be captured by the programme as well as by the herd health advisors.

The results from this survey suggested that many farmers expected that they could participate in a certification programme within the near future. Hence a certification scheme was implemented in August 2011 and has currently approximately 100 herds included. An initial requirement was that the farms should have been part of the control programme, but from November 2011 all herds can sign up. To obtain a certification status, it is a requirement that minimum 75% of the animals have been tested within the last 12 months. Based on the test-results, the age-distribution in the herd, the specificity and age-specific sensitivities for the milk-ELISA, the following parameters are estimated:

- The apparent prevalence, which is used for most categorisations
- The true prevalence, which is the apparent prevalence corrected for the herd’s age distribution as well as test specificity and age-specific sensitivity
- The probability that the herd is “free of MAP infection”, or more specifically has a lower prevalence than the Danish dairy herd. This estimation follows the principles described in Sergeant et al. (2008), although different parameter estimates for the tests are used due to a change in test
- The apparent prevalence in all herds, from which livestock has been purchased.
Subsequent to estimation of these parameters, the herd is categorised into one of 10 categories as specified in Figure 1.

![Figure 1](Matrix for categorisation of herds based on annual test results using milk antibody ELISA. Herds are classified based on their own test-prevalence (y-axis) and the prevalence in herds from which they have purchased livestock. To be classified “potentially free”, the herd should have no purchased animals in the herd and have a probability of “being free of infection” > 0.95 and an estimated true prevalence of <0.5%.

### RELIABILITY OF TEST RESULTS

Testing for either the control programme or the certification programme is done automatically based on samples from the milk recording scheme. Once a farmer has signed up, samples are automatically collected four times per year (in the control scheme) to ascertain that updated samples are always available. Subsequent to analysis at the laboratory, results are transferred to the Danish Cattle Database and immediately made available electronically to the farmer and those of his advisors having access to his herd data through a common internet-portal.

Several reports are available (samples given in Nielsen, 2009), and the level of detail might seem a bit overwhelming to the inexperienced user. However, most users seem to capture the details they want to use relatively fast. The testing system for the control scheme is relatively robust, because results are achieved four times per year. False-positive results are known to occur, but with frequent testing combined with experience, the understanding of false-positives seems to improve. There has, however, been major effort on communication to interpret test-results.

There have been several instances of farmers and advisors starting to question results. Some of these queries have been caused by actual testing problems that needed to be resolved. Many have been due to lack of understanding. To be able to address challenges that may arise if lack of
reliability suddenly accelerates by passing from mouth to mouth, a database with e-mails for all herd health advisors associated with the enrolled herds has been used. Any uncertainty has been addressed quickly to resolve such issues, and in general prompt communication with herd health advisors has been seen as a key effort.

MONITORING AND IMPROVEMENTS MADE

The prevalence appears to be decreasing (Nielsen et al., 2011). Within- and between-herd test prevalence’s are monitored and presented weekly in a publicly available website (http://kvaegvet.dk/ParaTB/PrevGraf7.html).

By 28 November 2011, 9% of herds in the control programme had a test-prevalence of 0% and the median within-herd test prevalence was 3.7%. Farmers obtain the within-herd prevalence along with the test-results. However, these results may be a bit challenging to understand over time. First, the test used was changed in October 2008. Test results of the old and new tests were not comparable, which continues to challenge the evaluation of test-prevalence development. Second, single test-positive results can impact the within-herd test-prevalence significantly, particularly in small herds.

The value of these graphs may therefore be limited, but farmers and advisors required those graphs, and therefore they were made available. In general, improvements to the programme have been user-driven. If there has not been a demand, new features have not been developed. Most new features have also been thoroughly discussed in an advisory board consisting of herd health advisors and programme managers.

RESEARCH AND FUNDING

Funding for research almost stopped with initiation of start of programme in 2006. A few private and public initiatives continued until 2009. After that date, limited research has been carried out. Funding for programme maintenance relied on less and less funding from the milk and beef levy funds, and from 2011 is almost 100% user-paid (through a herd fee of 50 EUR/year). This means that few new activities can be launched and system maintenance is becoming increasingly challenging.

LESSONS LEARNED

The Danish Cattle Association supported by science and local active advisors and veterinarians has run the programme. This collaboration has led to continuing development of tools used in the herds and constant focus on the importance of the programme. Experience from previous programmes (e.g. bovine tuberculosis, IBR, BVD and Salmonella Dublin) has been used extensively to:

- Describe key features for risk management
- Establish testing schemes
• Collect and manage test results and related data in a central database

• Establish test results reports for farmers and herd health advisors

• Communicate with farmers and herd health advisors.

These are also the points, at which focus has continuously been kept. ‘Risk assessment’ and ‘risk management’ were concepts that were not systematically used before this programme was launched. They now appear to be more common, but it has also been extremely difficult to monitor whether farmers continuously perform assessments and address the risks identified. A useful solution remains to be identified.

Communication to farmers and herd health advisors has also been key to establishment of the programme. Limited problems have been brought to the attention of the programme management, and all problems have so far been addressed instead of being ignored. In some situations, solutions have not been provided, but at least addressing the problem may provide the users with a sense of being taken seriously. Down-scaling of funding for both research and management of the programme may pose a threat to continued reduction in the future. Less attention to paratuberculosis centrally may also result in less attention locally, and the local attention must be considered vital to control of this infection.

REFERENCES


A voluntary Johne's engagement programme in UK Dairy Herds

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INTRODUCTION

The control of Johne’s in UK dairy and beef herds has been slow and challenging. The disease is still regarded as of historic interest by some, and the risks of Johne’s becoming a major economic burden on the cattle industry have not yet been fully appreciated by many stakeholders. Meanwhile, the risks of the disease spreading and rising in prevalence are high. Major initiatives are now gathering pace to manage the disease, particularly in the national dairy herd.

Previous Johne’s disease schemes that have focussed on test and cull programmes have not been popular, and have mostly only engaged beef breeding herds which seek accreditation of disease status. The dairy sector has lagged behind, but has now realised the potential threat to production efficiency.

The milk processors (a well organised and focussed group of major companies with representation as DairyUK) have used their resources to raise awareness of the issues, and engaged many of their contracted producers in the beginnings of a major Johne’s programme. Now, over 20% of all UK dairy producers have engaged in a novel approach to Johne’s management.

AIMS AND OBJECTIVES

The original objective of the milk processor organisations was to engage a wide range of dairy producers in Johne’s management through a phased programme of education and awareness, followed by a system to define disease status and implement controls for infected herds. Dairy UK, the milk processor representative body, helped co-ordinate the strategy. The agreement was to develop a common set of approaches and provide tools to deliver the same messages to every farmer within their respective milk pools. This collaborative approach between competitive companies has been major part of the success of the programme.

Some pump priming funding has been obtained from various sources, including the processors, and DairyCo, the UK dairy extension group which is itself funded by levy on producers.

The original strategy was quickly refined and extended to follow a series of three phases that would lead farmers into a complete programme of Johne’s prevention and control. The first phase was to include a system of risk assessment and analysis. A standardised risk assessment tool (myhealthyherd.com) was used to measure and analyse biosecurity and biocontainment risks on every dairy herd that engaged in the programme. This risk analysis was then combined with
the results of herd screening tests to determine status, to produce a prevalence report which not only defined the current infection status of the herd, but also the risks of disease becoming a problem in herds that were not yet infected, and the future prevalence in herds that were.

Figure 1 - The three phases of Johne’s engagement and management

Phase 2 comprised an informed discussion between farmer and trained veterinarian on the most constructive and appropriate way forward to prevent Johne’s disease if their herd was not yet infected or reduce the prevalence of Johne’s disease if it had been detected by the screening tests. It was made evident in the discussions and the risk reports generated by myhealthyherd.com that herds that tested negative may already be infected but not yet detectable. Complacency was avoided.

The veterinary surgeon had an option to have access to myhealthyherd.com for the construction of a specific control and protection plan based on the farmer’s aspirations and resources. There future construction of robust surveillance, control and management plans relied on a private arrangement between the veterinarian (who had been specifically trained) and the farmer.
The progress through the Johne’s management programme could be monitored by the farmer, vet or regional monitoring organisation using myhealthyherd.com. A system of secure access allowed farmers to follow their own progress, veterinarians to manage the progress of their clients, and monitoring organisations to monitor the overall programme.

In some regions Rural Development Program for England (RDPE) funding was available for the farmers to subsidise the implementation of the prevention and control plans, which undoubtedly speeded up the engagement of farmers and vets. The South West region (which contains about 35% of England’s dairy cows) was particularly successful in engaging farmers in a structured programme that was 70% funded by the RDPE, with over 1000 dairy farms in the region currently taking part in the scheme.

A significant challenge to the success of the programme was the understanding of the principles behind the system, particularly by the veterinarians who were to implement the scheme. Traditional veterinary views on testing and treating disease had to be overcome, and the basic ideology of preventing disease by managing risk was included in the structured veterinary education programme that became an integral part of the scheme.

Veterinarians were informed of the principles of infectious disease management using an image of four pillars, which demonstrated the need for risk management, surveillance and resilience as well as control systems, in the management of Johne’s disease. The four pillars supporting disease status are defined by the relative contributions of biosecurity (risks of disease introduction), surveillance, resilience or immunity and control (chiefly management of bio-containment risks). Testing alone would never be enough to manage this disease successfully, and indeed, once the principles were understood, the use of testing and other surveillance tools
for different purposes such as determining prevalence, and then as tools for identification and control, became evident to participating veterinarians and farmers.

![Figure 3 - The four pillars supporting the disease status of a herd](image)

Using these disease management principles which form the basis of infectious disease management protocols within myhealthyherd.com, veterinarians and farmers developed and implemented specific prevention and control programmes for their herds which met their agreed aspirations and could be delivered within the availability of resources. The plans needed to be practical and effective, and provide a benefit to both farmer and veterinarian if they were to work and be maintained.

Myhealthyherd.com offers options for prevention and control to the farmer and veterinarian, who agree a strategy suitable for the herd, and then generate a list of agreed tasks that will meet the agreed strategic approach. Options for controlling disease in infected herds include traditional test and cull programmes, alongside improved farm management to prevent spread, vaccination where deemed necessary, and broad strategies for when resources are limited such as breeding to beef and replacing infected breeding cows with non-infected cows over time. The most popular strategy has been the risk based systems developed in the Danish programmes, where infectious cows are identified by categorisation of the herd into risk groups and selective management of the high risk groups to prevent the spread of the disease within the herd (Nielsen, S.S. 2007).

Because of the inherent delays in observing any tangible success in Johne’s management, the robustness of any control plan formulated using myhealthyherd.com is automatically scored. Plans that involve the management of risk are inherently risky, as any failure to comply with the requirement of the plan will lead to failure which is only evident some years later. Hence the need to ensure that the plan will work before any surveillance programme shows demonstrates its failure.
Low prevalence herds that aspire to disease accreditation may enter an Officially Accredited Free Johne’s program operated through the Cattle Health and Certification Standards Scheme (Statham 2011) that are already established and have their own set of standards. It is intended that these herds then become a nucleus of low risk stock to provide breeding animals of known disease status.

LESSONS LEARNED

It has become clear that education and awareness is essential for the programme to succeed. Both farmers and veterinarians need to be fully aware of the issues that surround Johne’s disease; traditional views that the disease is a sporadic clinical condition of adult cows still prevail. Indeed, the lack of understanding of many veterinarians has led to some obstruction in the adoption of the programme by some farmers. Conversely, there is some evidence gained from questionnaires provided at some of the farmer meetings that a significant number of farmers consider that they know enough to manage Johne’s disease in their herds without any professional help.

A team of well informed veterinary surgeons were commissioned to deliver education and awareness to farmers through a series of farmer meetings using a standardised presentation. Over 70 farmer meetings have been delivered by this team, most of which have been organised by the milk processor companies. The Johne’s team were specifically trained in the detail of risk management systems (Soren Nielsen 2007, 2009) and with reference to other schemes (Notably the North American work of Rossiter et al 1998).

The education and awareness programme engaged farmers into Phase 1 of the programme, and the majority who attended the meetings completed a risk assessment and screening surveillance to determine the risk and disease status of their herds. The analysis of these biosecurity and biocontainment risk from these herds emphasised the problem that faces UK dairy herds, and has caused some concern for the future prevalence of Johne’s disease in UK dairy herds.

Herds are classified according to the risk scored for biosecurity and biocontainment, as well as their infection status. The risk scores provide a better determinant of future prevalence than the current infection status, which really reflects historic infection.

Over 50% of the UK dairy herds currently participating in the programme are at high risk of Johne’s disease entering their herd, and less than 20% can consider themselves reasonably biosecure.
Figure 4 - Johne’s biosecurity risk status of 2503 dairy herds engaged in the myhealthyherd.com Johne’s management system.

Bio-containment risks are the multiplier for the disease, and of great concern is that nearly 80% of participating dairy herds have high risks of spread of Johne’s should the herd already be infected.

Figure 5 - Johne’s biocontainment risk status of 2059 UK dairy herds engaged in the myhealthyherd.com Johne’s management system
These high biosecurity and bio-containment risks have been brought about not least by the changes in dairy production over recent years:

- Herd expansion – the average herd size in the UK has doubled in recent years and is now over 120 cows
- Recent disease outbreaks such as BSE, FMD and TB - causing large movements of cattle between herds as part of the restocking process
- Modern farming practices such as housing, group calving yards, pooled colostrum which have the inherent risks of environmental contamination from heavy shedding cows spreading the disease.

These and many other risks are included in the assessment, each of which is weighted and scored to provide the overall categorisation of the farm.

The high risks of Johne’s disease are reflected in the prevalence of disease: some 75% of herds participating in the South West Regional programme have been classified as infected by the attending veterinary surgeons, based on screening tests. This prevalence is most probably an exaggeration of the overall prevalence of the disease in the UK dairy herd, as the scheme is strictly voluntary and has probably selectively engaged high risk herds from the outset.

The tests mostly comprise the IDEX ELISA testing of milk from thirty selected cows, selected for their high probability of infection and detectable antibody should the disease exist in the herd. A further lesson learnt is that the proper selection of target cows for the screen is essential to get a sensitive determination of disease status. The results of the screen can be manipulated by the inappropriate selection of cattle for testing, and veterinary involvement is critical to ensure the right selection.

In the early stages of the scheme, it became evident that inconsistent advice and guidance from the local veterinarians ran the risk of undermining progress with the scheme. Prior to the programme launch the level of knowledge within the veterinary community about effective control strategies for Johne’s disease was often limited. Traditional test-and-cull programmes were promoted by the laboratories as the solution to every herd. These programmes were originally designed to confirm the absence of disease in low prevalence herds but if applied without reference to the risks management processes, they often failed to achieve a satisfactory reduction in incidence and were not cost effective.

Traditional test-and-cull and test-and-manage strategies for Johne’s disease management tend to focus on infected herds: there has been little enthusiasm to detect herds that are at risk of disease but not yet infected. These herds need protection if the overall objective of increasing the proportion of low prevalence herds is to be achieved. Convincing farmers and veterinarians of the value of prevention has been challenging, not least due to the lack of business models that reward veterinarians in private practice for the absence of disease.
A survey was conducted to discover the intentions of farmers that were attending education and awareness meetings, and their plans to engage in the phases of the programme.

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<th>Phone my vet as soon as I get the screen results to arrange a dedicated visit to set up a Johne’s protection and control plan</th>
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<th>Talk to my vet when he/she is next on the farm about Johne’s disease protection and control</th>
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**Figure 6 - Analysis of the future intentions of the farmers after initial training**

The challenge remains as to how best to provide effective drivers for low prevalence herds to take part in the programme as early indications are that high risk, infected herds are volunteering whilst those that consider themselves as unlikely to be infected are not engaging. Systems to add value to low prevalence herds are being devised to incentivise those herds that are not yet infected to become engaged and enjoy direct economic benefits of demonstrating their status.

Because of the chronic nature of Johne’s prevention and control, long term planning and delivery is required. Training emphasises that infected herds may need a five to ten year plan for control and total eradication may not be realistic. There is a real risk that “mission drift” can occur on plans created and selective application of controls can subsequently take place which can result in 80% control and 100% failure. The need to constantly review the control program has been identified and will be addressed by the inclusion of an indicator within Myhealthyherd system to show that plans require review on a regular and frequent basis. Regular review is essential for consistent application of the control tasks.

In September 2011, a large retailer with a direct supply of milk instructed its 800+ farm suppliers to test all their cattle every 3 months using the Danish Risk Based programme with reporting of Red (repeat test positive) cattle to a central database held by the retailer along with other health measures. The agreement is to simply test the cattle with no compulsion for robust control. This unilateral and competitive stance has caused a great deal of difficulty with the Dairy UK driven collaborative programme and demonstrates the lack of understanding of this disease within groups of well intentioned but misinformed groups who hold considerable power and influence. The potential threat of discrimination by purchasers based on test prevalence has largely prevented the planned next phase of development- the development of a pool of low prevalence herds on a voluntary basis. There is a risk that other retailers may seek to do the same and develop their own versions of success.

A more robust and meaningful set of success measures is yet to be determined. Because of the historic nature of test results, there is a need to measure current progression and status rather
than historic infection. Current surveillance systems based on the testing of antibody and the presence of detectable organisms tend to reflect risk some five to ten years previous, and infection three to five years previous to detection. Better determinants of success will probably revolve around a measure of risk combined with selective testing while a more immediate sensitive test is developed to detect early infection.

The Dairy UK group are now reconsidering the next steps. A rational approach would be to ensure that every dairy producer has a robust control and protection plan installed by a trained veterinarian. This is more likely to deliver success and widespread engagement and the tracking of progress in this area may be the focus of the next stage of development within the UK.

**IMPROVEMENTS MADE**

The key improvements and developments made during this process have been:

- To create win wins where they can be made, ensuring that every partner benefits from Johne’s management. This ensures that the expertise and enthusiasm of all parties to seek to drive the programme in a co-ordinated way
- To reinforce the need for collaboration, confidentiality and consistency of approach
- To avoid squabbling about testing approaches. Tests can be part of the solution but also part of the problem. The focus is kept firmly on risk management with testing used to determine herd status and then maintain enthusiasm to improve the effectiveness of controls rather than being central to the programme. Control strategies are possible without testing
- To keep to the principles of “farmer choice” based on resources and aspirations. Once size does not fit all and providing a wide range of approaches has been fundamental to widening engagement. This then creates a sense of farmer ownership of the programme
- Ensuring that farmers do not test animals prior to understanding the disease process. Testing without a clear understanding of the epidemiology of the disease and the limitations of tests leads to mismanagement. There are examples where positives cows are found and culled and the farmer believes the problem has been sorted and the opportunity to interpret the significance and develop a robust plan has been lost
- Ensuring a central group of Johne's stakeholders meet on a 3 monthly basis to monitor progress. Short action orientated meetings are essential
- Ensuring that vets are educated prior to or shortly after the roll out to farmers. The vets may not wish to get trained unless there is a demand
- Communication. Making sure vets, farmers and third parties all receive a common message
- Ensuring that control plans instituted are robust enough to control disease. Typically this is done by audit but the intention will be to do this automatically using myhealthyherd.com for those groups that wish to use the tool
- Having a central web based management programme has been fundamental to ensuring consistency of delivery and approach. This has also allowed easily accessible progress indicators on a regional or national basis.

The complexity of the UK dairy industry and the competitive nature of the retailers and processors have created complications that many other countries may not have to overcome. However with persistence progress to reducing the prevalence of MAP within the UK Dairy Herd is achievable using a commercially driven farmer initiated programme.

REFERENCES


**USEFUL WEBSITES**

Proceedings Dairy UK Johne's meeting www.dairyuk.org
Myhealthyherd www.myhealthyherd.com
Johne's information www.johnes.org
Herdwise www.nmr.co.uk/herdwise
**Johne’s disease control in Ireland- past, present and future**

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**INTRODUCTION**

At the end of December 2009, the bovine population in Ireland was distributed between 123,500 herds of which 19,700 were dairy farms. In total, there were 6.5m bovine animals in the country including 3.4m females and 300,000 bulls aged 12-months-of-age or over. (AIM 2009).\(^i\) Just over one million of these were dairy cows.\(^ii\) The milk from these cows was supplied to thirty-two cooperatives.

Exports of Irish dairy products and ingredients were valued in the order of €2.29 billion. In 2010, total Irish milk output amounted to 5,582 million litres with an estimated value of €1,536 million.\(^iii\) Three of the key players internationally in the infant milk formula sector are located in Ireland supplying 15% of the global requirement with a combined turnover of €667m in 2008.\(^iv\)

The prevalence in Ireland of Johne’s disease has been shown by two prevalence surveys. The first of these estimated herd prevalence in dairy herds to be approximately twenty per cent (Good et al., 2009).\(^v\) A second prevalence survey will be reported in an oral presentation at the 11th International Colloquium on Paratuberculosis.

Briefly, a prevalence survey based on detection of serum antibodies was carried out on 1654 Irish herds picked randomly from all the herds in the country which were subjected to an annual brucellosis test in 2009. All 78,123 females and breeding bulls over 24 months-of-age in these herds were tested using the ID vet ELISA test.\(^vi\) There were 286 positive herds of which 91 herds had two or more positives. The overall prevalence of infected herds, based on the presence of at least one ELISA-positive animal, was 17.41%. The herd prevalence level amongst dairy herds (27.76%) was higher than among beef herds (12.7%). The animal level prevalence for all breeds was 0.60%. The corrected overall herd seroprevalence excluding those with only one positive result was 5.50%, representing 9.7% of dairy herds and 3.3% of beef herds. These figures compare favourably with those reported for other countries.

Johne’s disease has been increasing in incidence in Ireland in recent years (Figure 1). There were ninety-two positive faecal samples detected between 1932 and 1982, but there were one hundred and fifty in 2003 alone. Much of this increase in incidence has been attributed to the large number of cattle that were imported in the intervening years (Richardson et al. 2009, Barrett et al. 2011).
There were a total of fifty-two thousand cattle imported between 1992 and 1996, sixteen thousand from each of France, Germany and Netherlands, almost three thousand from Denmark and smaller numbers from Belgium, UK and Italy.

A survey of sixteen herds with imported animals by O’Doherty et al. in 2000 showed that of 226 animals tested eight were positive by ELISA and nine positive on faecal culture. 25% of herds were ELISA positive and 37.5% faecal positive.

**AIMS AND OBJECTIVES**

To present a summary of past, present and future Johne’s disease control in Ireland.

Because of the increasing prevalence of Johne’s disease in Ireland a Pilot Herd Health Project was set up in 2004. Details of this have been reported in full previously (Mullowney et al. 2009). This Pilot project was subsidised by the Department of Agriculture Food and the Marine. Johne’s disease was included in the pilot herd health programme because of its increasing incidence worldwide and the possibility that it might be a zoonosis. This was of major concern to the dairy industry in Ireland.

The industry and farm organisations agreed there was need for action to address the increasing prevalence of infection and to mitigate potential consumer concerns. However diagnostic tests for Johne’s were poor and control programmes that had been established in Holland, USA and Australia had met with varying degrees of success. One of the concerns of the stakeholders was who would pay for the scheme. The key drivers in the Herd Health Pilot Programme were veterinary practitioners. The Department of Agriculture gave initial financial support. Other diseases of concern to participants included in the pilot programme were Bovine Viral Diarrhoea (BVD) & Infectious Bovine Rhinotracheitis (IBR).

The initial communication in setting up the pilot project was with farmers, vets, industry and farming organisations.

A Johne’s disease-specific booklet was distributed to all dairy and beef farmers and made available on the Department’s website. Seminars were held to highlight the need for herd health
in the changing EU farming environment. The economic impact of the disease was stressed and a herd, which showed marked reduction in milk yield and profit per cow during the period of infection, was used as a case study.

The initial communication with vets consisted of a specific Johne’s disease booklet distributed to all vets, regional Scientific Seminars and regional training courses for all interested veterinary practitioners.

At the training courses lectures were given on Johnne’s, IBR, BVD and Epidemiology and Risk Analysis. Four different workshops on risk analysis for Johnne’s disease in dairy herds, Johnne’s disease in suckler herds, IBR and BVD were held. The lectures were recorded on video and distributed to the participants on a CD. Relevant articles on the three diseases were also given to participants. The risk assessment templates, which were based on those published by Rossiter et al., were designed in text and spreadsheet format and follow up workshops were held twelve months after commencement of the scheme to review progress. The Herd Health Programme was subsidised by the Department of Agriculture who paid a fee to practitioners for the risk assessment on three to four chosen herds each. Laboratory testing was free to farmer participants. Thirty-five vets attended the course and twenty-two enrolled clients. Sixty-eight risk analyses were carried out on herds. Sixty-three of these herds decided to participate in a Johnne’s disease control programme, nineteen in BVD and six in IBR. Following the initial farm visit and risk assessment, a sampling strategy and disease control plan was put in place. Most participants found that the Risk Analysis Template took longer to complete than they expected but found it useful in comparing with the next year’s results and that the farmer client had agreed targets.

The scheme aimed to establish pilot herds in each participating practice, which could then be used to extend a similar scheme to other herds in the practice, and the disease control procedures could be used as examples for other diseases.

The industry and farming organisations were given regular updates on progress of the pilot project and reports were submitted to the Irish Farmers Journal.

A daylong seminar on Johnne’s disease was held in August 2005. All participating vets and farmers and other interested parties were invited and about 120 attended. The main speakers were Drs Mike Collins and Jeannette McDonald of the University of Wisconsin and Dr Bob Whitlock of the University of Pennsylvania.

A further daylong seminar on Johnne’s disease and BVD for participating vets and farmers was held in December 2007. This was followed by a daylong workshop where individual problems on each herd were addressed by the main speakers Prof. Joe Brownlie of the Royal Veterinary College, London and Prof. Soren Nielsen of the University of Copenhagen.

Sixty-three of the sixty-eight herds participating in the pilot project tested for Johnne’s disease. Some herds wanted to establish that they did not have a Johnne’s problem and therefore only
took faecal samples for fear of false positives on the ELISA test. Of the twenty herds that carried out faecal sampling fourteen herds had all animals negative but further sampling was not carried out in these herds. Six herds had positive animals on the faecal test. Because of the relocation of the diagnostic laboratory shortly after the start of the scheme there was a delay in reporting faecal culture findings. This resulted in most practitioners using the ELISA test afterwards and of the fourteen herds with negative faecal herd tests, seven subsequently had positive animals on ELISA tests. Twenty of the twenty-nine herds that had only one ELISA test done had positive animals.

Twelve of these herds were in 2005, of which seven were positive and these herds may have dropped out of the programme. Of the sixteen herds, that have only had one test in subsequent years, twelve were positive. Of the thirty-four herds that had more than one ELISA herd test carried out all except four herds had positive animals. Some herdowners may have been of the mistaken opinion that one test would have indicated freedom from the disease. Some were looking for a certification programme of freedom.

Of the forty-six dairy herds participating in the Johne’s programme, only thirteen had not bought in any cattle in the previous twelve months and eight had only bought in a bull and of these twenty one herds, fifteen had a positive test result. A herd would need to be closed in order to have meaningful certification. If a suitable number of closed herds were interested in participating in a certified freedom programme, the Danish milk ELISA test, taken four times a year, might have been a more convenient way of monitoring. We are in the process of setting up an on line training system for participating farmers and veterinarians which will be outlined in a poster at the 11th International Colloquium on Paratuberculosis.

LESSONS LEARNED

The pilot programme demonstrated that it was possible, with sufficient knowledge and commitment, to implement successful Johne’s disease control at farm level. A number of further lessons also emerged from the pilot programme. These included the importance of education of farmers and veterinary surgeons; a clear understanding of the limitations and uses of diagnostic tests; the need to clearly communicate achievable goals and the timelines associated with these; the challenge of motivating farmers to stick with a programme and the challenge of scaling up this type of approach to a national level.

IMPROVEMENTS MADE

As described above, agriculture is a very important contributor to the Irish economy and historically national animal health services have been a government, rather than an industry, responsibility (More 2008). However, in 2009, Animal Health Ireland (AHI; www.animalhealthireland.ie) was established to provide a partnership approach to national leadership of non-regulatory animal health issues (those not subject to national and/or EU regulation). The national Department of Agriculture, Food and the Marine (DAFM) remains the lead organisation for the implementation of relevant national and EU policy and the
management of national disease control programmes, relating to regulated endemic and exotic diseases such as bovine tuberculosis, bovine brucellosis and bovine spongiform encephalopathy and foot and mouth.

AHI brings together livestock producers, processors, animal health advisers and government (More et al. 2011). The partner organisations have committed to provide financial support to AHI for an initial period of five years. The main aims of organisation are, through superior animal health and welfare, to improve overall profitability for individual farmers and the agri-food industry and to enhance the competitiveness of Irish livestock and food in the international marketplace.

The objective prioritisation of non-regulatory animal health issues was undertaken through an expert Policy Delphi study and farmer surveys (More et al. 2010). As a result of this and subsequent work, Johne’s disease, along with bovine viral diarrhoea and infectious bovine rhinotracheitis, were identified as the prioritized diseases with a biosecurity component. The model by which AHI addresses each of these groups is to convene a technical working group comprising experts in each of the diseases. For Johne’s disease, a group drawing representatives with appropriate experience from academia, the advisory services, government and field veterinarians has been convened.

An initial task of the TWG has been to develop information resources for farmers and veterinary surgeons and to raise awareness and understanding of Johne’s disease. An information leaflet on Johne’s disease, accompanied by a more detailed document giving answers to frequently asked questions has been prepared and will form the basis of a series of roadshows for industry (see www.animalhealthireland.ie).

AHI has been actively involved in consultations with the industry at processor level and one outcome of these discussions has been that the TWG has been working on a proposal for a voluntary national Johne’s disease programme. It is intended that this will involve herd classification. However, optimal testing strategies for initial herd screening and subsequent testing for Johne’s disease in suckler and dairy herds in Ireland are currently not known.

In recognition of the difficulties in categorisation of herds as infected or uninfected, the TWG has sought to use a confidence based approach to this problem, and has invested considerable effort in developing an epidemiological model to evaluate a range of testing strategies in an Irish context, with a focus on detection probability (given a specified design prevalence) and cost effectiveness. A simulation model has been developed in the programming language R. Key model inputs include sensitivity and specificity estimates for the individual serum ELISA, the individual milk ELISA and the faecal culture (these being the only tests where sufficiently robust scientific data are available through international peer reviewed publication), the design prevalence, purchase history, testing options and testing costs. Key model outputs include SeH (the probability that infection will be detected, if present at the design prevalence or greater) and ProbF (the probability that infection in the herd is either absent or at very low prevalence (less than the design prevalence). The model allows comparative strategies to be evaluated, and
ProbF, which is influenced by SeH, the prior probability of infection and the probability of introduction, could form the basis for herd classification. The model may also be run over multiple iterations, allowing the change in ProbF with time to be evaluated under different circumstances (Figure 2).

The TWG intends to deliver its recommendations to industry early in 2012. Thereafter, a cross-industry Implementation Group will be convened to take the programme forward.

The overall goals of the programme are as follows:

- To increase awareness within industry and the advisory services, including veterinary surgeons, thereby facilitating informed decision-making
- To reduce herd and within-herd prevalence, thereby minimising on-farm losses and the between-herd spread of infection, and safeguarding the quality of Irish livestock and livestock products
- Safeguard the quality of Irish livestock and livestock products.

Initial herd categorization will take into account the type (suckler or dairy) of herd, as these each have different prior probabilities of infection, and the purchase history (bioexclusion) of the herd and source of these purchases.

For herds with negative test results, the model will use all of this information to assign a ProbF value, and this in turn will be used to assign the herd to a given risk ranking. For herds with positive results, the principle emphasis will be on biocontainment practices, with ongoing veterinary risk assessment envisaged to identify and prioritize required management changes.

Potentially these biocontainment risk assessments may also be used within test negative herds with low ProbF due to poor bioexclusion practices. In these herds, optimisation of biocontainment practices will serve to minimize the spread of infection which is present but thus far undetected. Over time, herds with increasing ProbF or decreasing prevalence of infection will be able to improve their assigned status by implementing appropriate bio-exclusion and biocontainment practices along with regular testing.

The Irish dairy industry has clearly signalled its intention to address Johne’s disease and to seek to build on the current low prevalence of infection. Already, one processor has put in place a programme of whole herd individual testing (over two years of age), risk assessment and biocontainment advice. This is delivered by the herds’ veterinary surgeons and will be aligned with the national programme as the latter is rolled out.
Confidence of freedom (ProbF) from infection over five years of annual testing given four animal purchasing scenarios and assuming negative testing results at each annual test. The following were assumed: a herd of 100 dairy cows, 100% sampling of all animals >2 years of age, and a design prevalence of one animal. Each animal was tested using individual milk ELISA and, if positive, confirmatory individual faecal culture. The risk of introduction prior to year one was assumed to be zero.

ACKNOWLEDGEMENTS

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REFERENCES

i AIM Bovine Statistics Report 2009


Evaluation of critical control points in dairy herd management to reduce transmission of *Mycobacterium avium* subsp. *paratuberculosis* - Results from controlled clinical trials

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**INTRODUCTION**

The 2007 NAHMS National Dairy study identified *Mycobacterium avium* subsp. *paratuberculosis* (MAP) on 68% of operations tested (USDA, 2008b). Strategies to control Johne’s disease in an infected herd have historically focused on 1) eliminating transmission of the organism to susceptible cattle and 2) identifying and removing test-positive cattle. However, because test sensitivity is less than 50%, reliance on test-and-remove strategies will not be completely successful. Accordingly, management changes must be instituted as part of a control program to reduce transmission to susceptible livestock on infected dairies.

Evidence is emerging that Johne’s Disease control programs focused on herd management practices can reduce the incidence of disease. A prospective longitudinal observational study was conducted to evaluate the effect of a standardized control program on the incidence of Johne’s disease in eight dairy herds in Minnesota (Espejo et al, 2011). Depending on recruitment year, herds were followed between 5 to 10 years. Program compliance was evaluated using a cohort risk assessment score by birth cohort. Fecal samples from cows in study herds were tested annually using bacterial culture to detect MAP and serum samples from study cows were tested using an ELISA to detect antibody to MAP. Cohort risk assessment score decreased by birth cohorts, indicating that herds complied with the recommended management practices. Birth cohorts were followed to describe changes in the time to MAP bacterial culture positivity, serum ELISA positivity, and clinical Johne’s disease. Analysis indicated a reduction of the instantaneous hazard ratio by birth cohorts and by cohort risk score, consistent with a within-herd reduction of Johne’s disease transmission as part of the control program. To date, however, long-term prospective field studies have been lacking to evaluate the biological efficacy and cost-benefit of specific management interventions.

**AIMS AND OBJECTIVES**

The following report will review some of the common management practices currently recommended to dairy producers as well as describe (preliminary) results of a series of ongoing field studies designed to evaluate the efficacy of specific Johne’s disease control strategies. Focus
areas will include maternity pen management, off-site heifer rearing, colostrum management, milk feeding programs, exposure of adult dairy cattle, and vaccination.

LESSONS LEARNED

1. Maternity Pen Management

One of the earliest potential exposures of dairy replacement heifers to contaminated fecal material from infected cows occurs in the first few hours of life within the maternity area where the calf is born. Johne’s Disease herd risk assessments place an emphasis on this area of management, with common recommendations including the use of individual calving pens that are cleaned between successive uses (vs. calving cows in a group pen on a bedded pack; Rossiter and Hansen, 2000). A clinical trial was initiated in 2005 to evaluate the effect of maternity pen management (individual vs. group maternity pens) on the transmission of MAP to newborn calves.

Pregnant cows from three Minnesota herds with clinical Johne’s disease and >10% seroprevalence for MAP were systematically allocated to calve in either individual cow maternity pens or the multiple cow maternity housing area. Between January and December 2005, a total of 456 heifer calves born into these 3 herds were enrolled into the maternity pen management trial study. 242 (53%) of these calves were born in individual maternity pens cleaned between uses and 214 (47%) were born in multiple cow calving pens. In the short-term, treatment had no measurable effect on neonatal calf morbidity and mortality risk within the study herds (Pithua et al., 2010). The first round of testing began in early 2007, with each enrolled cow at approximately 2 years of age tested for subclinical MAP infection using a serum ELISA antibody test and bacterial culture for isolating MAP from fecal samples. Final results are pending.

2. Off-site Heifer Rearing

The results of a computer simulation study by Groenendaal and Galligan (1999) suggested that removing the calf off-site at one day of age (until 12 mos. of age) would be more effective in reducing transmission of MAP than removing the calf at 30 or 180 days of age. In 2003, a prospective cohort study was implemented in a 3100-cow California dairy to test the hypothesis that off-site heifer rearing results in a lower incidence of MAP. Three cohorts of approximately 800 heifers each (1 = raised on site continuously; 2 = raised on site until about 5 months of age and then off-site in Nevada until approximately 20 to 22 months; 3 = raised off site from approximately the second day of life until 20 to 22 months) were enrolled in the study. Females have been tested at least annually by serum ELISA or milk ELISA and by fecal culture since first calving. As of January 2009, all cows were in either lactation 2 or 3. Preliminary results from 1st and 2nd lactations showed a numeric decrease in risk for testing positive to MAP in animals raised off-site (Cohort 2 = 3.6%; Cohort 3 = 2.3%) as compared to animals raised on site (Cohort 1 = 4.6%). Additional test results and data collection from remaining cows has been collected through the end of lactation 3 (results pending).
3. Colostrum Management

While the most important route of transmission is generally considered to be through ingestion of infective feces in the calf’s environment, other potential sources of transmission could include shedding of the organism into colostrum or milk. One study reported that up to 22% of infected cows shed the organism in milk and colostrum (Streeter et al., 1995). Options to reduce transmission risk through colostrum could include avoiding feeding pooled colostrum, feeding colostrum from “test-negative” cows, heat-treating colostrum, or feeding either commercial milk replacer or pasteurized waste milk to calves.

Heat-treating colostrum. Researchers at the University of Minnesota have successfully developed a method for on-farm heat-treatment of colostrum at 60°C x 60 min., preserving important immunoglobulin proteins (IgG) while reducing or eliminating important pathogens including MAP (McMartin et al., 2006; Godden et al., 2006). In a pilot study, heat-treatment resulted in no significant effect on colostral IgG (mg/ml) but significantly reduced colostral bacteria counts. Passive transfer of IgG was improved in calves fed heat-treated colostrum (Johnson et al., 2007).

In a field study initiated in 2007, 1102 newborn heifer calves from 6 herds were alternately assigned to be fed 3.8 L of either raw or heat-treated colostrum within 2 hours of birth. Results from this study included that heat-treating colostrum had no effect on colostral IgG concentration but significantly reduced colostral bacterial counts (Donahue et al., 2008). Mean serum IgG concentration was significantly greater and morbidity was significantly reduced for calves fed heat-treated colostrum vs calves fed raw colostrum (Godden et al., 2011. In preparation). The long-term follow-up phase of this study began with testing of first lactation study animals for infection with MAP using serum ELISA and fecal culture, in early winter of 2010 and final results are pending.

Commercial Colostrum Replacers. In 2003, a controlled field study was initiated to evaluate the effect of feeding maternal colostrum (vs. colostrum substitute) on the risk for MAP transmission in newborn calves. 433 newborn heifer calves from 12 dairy herds were fed either a) raw maternal colostrum (MC) or b) a commercial colostrum replacer (CR) (Acquire®, A.P.C. Inc. Ames, IA). All animals were tested for MAP at approx. 30, 42 and 54 mos of age using serum ELISA and fecal culture. The cumulative proportion of study animals testing positive for MAP was 12% (31/261) in the MC vs. 8% (18/236) in CR group, respectively.

Survival analysis indicated a 44% (Haz. ratio = 0.56, P = 0.056) reduction in the hazard of MAP infection for the CR-fed group as compared to the MC-fed group (Pithua et al. 2009). These results demonstrate not only that raw maternal colostrum is a risk for transmission of MAP, but also that feeding a commercial colostrum replacer can be an effective risk mitigation strategy.

4. Milk Feeding Programs
While many laboratory studies report that pasteurization eliminated all viable bacteria (Stabel, 1996; Keswani and Frank, 1998; Grant et al., 1999; Stabel, 2001; Gao et al., 2002; Stabel et al., 2003), others reported some colonies surviving pasteurization if the milk was inoculated at high concentrations (Chiodini and Hermon-Taylor, 1993; Grant et al., 1996). In 2002, a long-term field study was initiated to evaluate the effect of feeding pasteurized waste milk (vs. commercial milk replacer) for control of MAP transmission in dairy calves. In 2002, 438 heifer and bull calves were assigned at 1-2 d of age to be fed either pasteurized non-saleable milk (PM) or a commercial 20:20 milk replacer (MR) until weaned. Preweaning health and growth was significantly improved in calves fed pasteurized whole milk (Godden et al., 2005). Testing using blood and fecal samples collected from study animals at an average of 25, 42, and 56 mos. of age indicated there was no difference in risk for a positive MAP test for cows fed MR (27.8%) as compared to cows fed PM (21.5%) (Hazard rate ratio$_{MR}$ = 1.38; P = 0.36; Godden et al., 2008). Furthermore, calves originally fed pasteurized milk had improved milk production in the first two lactations plus improved longevity in the herd. These results suggest that feeding pasteurized waste milk can be an effective part of a comprehensive Johne’s control program.

5. Management of Adult Dairy Cattle

It is generally considered that susceptibility to infection is highest in youngstock, but that horizontal transmission is insignificant in adults (Payne and Rankin 1961, Larsen et al, 1975; Whitlock and Buergelt, 1996; NRC, 2003). Also, due to the long incubation period of clinical Johne’s disease (usually > 2 yrs), it is hypothesized that even if dairy cows could become newly infected as adults, the economic impact of these late infections would be insignificant because most cows will likely be culled or removed from the herd for other reasons prior to the animal experiencing negative biologic effects of subclinical or clinical Johne’s disease.

In summer of 2003, a study was initiated to evaluate the effect of delaying exposure to MAP until adulthood on the development of new infections in adult dairy cows. Unclassified or high Johne’s disease incidence herds were identified that purchased replacement cattle from uninfected herds. Several of these purchasing herds were visited in summer 2003 and initial blood and fecal samples were collected from the purchased replacements raised in uninfected herds (exposed) and homebred cows of similar age and stage of lactation (non-exposed). Each case animal (purchased replacement) was randomly matched to three non-exposed controls.

Blood and fecal samples from study cattle were tested using the ELISA for detection of antibodies to MAP and fecal culture.

Results from testing in 2004 indicated that dairy cattle raised in Johne’s low risk herds and introduced to Johne’s infected herds were less likely to test positive for Johne’s disease than herdmates raised in infected herds (OR = 0.10, 95% CI = 0.01-0.75) for antibody to MAP and OR = 0.38, 95% CI = 0.14-0.98 for bacterial culture for MAP in feces; Kovich et al, 2006). Analysis using a longitudinal approach, however, indicates that this reduction in test-positivity based on delayed exposure to MAP is lost through time in the herd.
6. Vaccination

A controlled clinical trial was conducted to evaluate the effect of vaccination with a whole-cell killed Johne’s disease vaccine on subclinical and clinical paratuberculosis, milk production, reproduction, and longevity in dairy herds (Knust et al, 2009). In this trial, 162 vaccinated and 145 unvaccinated dairy cows from three herds in Wisconsin. Every other heifer calf born in each herd was administered killed Johne’s disease vaccine. Fecal samples were collected annually and bacterial culture for MAP using liquid media was performed over seven years. Production records and culture results were evaluated to determine the effect of vaccination on whole herd fecal prevalence, and, among study animals, fecal shedding, onset of clinical Johne’s disease, overall survival in the herd, milk production, and time to conception. Whole-herd fecal prevalence decreased from the start of the study. Vaccinates had significantly lower hazard of a positive fecal culture than controls over time, and fewer vaccinates developed clinical Johne’s disease than controls, with a longer mean time to culling for clinical Johne’s disease. Overall survival in the herd was not significantly different between vaccinates and controls, nor was total milk production or time to conception per lactation. Cattle vaccinated with killed Johne’s disease vaccine had lower risk of fecal shedding and longer time to development of clinical Johne’s disease. Additionally, whole-herd fecal prevalence in study herds decreased after vaccination was started, indicating that vaccination can be an effective tool as part of a control program in managing Johne’s disease.

SUMMARY

Johne’s disease is recognized as one of the most costly infectious diseases in the United States dairy industry today, and it is well understood that producers should adopt management practices designed to control the transmission of MAP in infected dairy herds. Modes of MAP transmission however have been inadequately understood, and the efficacy and cost-effectiveness of current recommended control programs have previously not been formally evaluated in controlled field studies. Though some of the aforementioned studies are not yet completed, already they have yielded results that have helped to improve our understanding of the epidemiology of transmission of MAP to youngstock and adult animals, as well as to identify useful management strategies for controlling this costly disease. Once this series of studies is concluded, the results will be useful in helping to develop more comprehensive Johne’s disease control programs that are both scientifically sound and cost-effective.

REFERENCES


It's about dollars and sense - control programs for paratuberculosis in beef cattle in the USA

Allen Roussel DVM MS

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INTRODUCTION

I would like to discuss two related topics concerning control programs for paratuberculosis in beef cattle. The Voluntary Bovine Johne’s Disease Control Program (VBJCP) of the United States is the “national” program of the country. Certainly there were successes and failures of the program, but by and large, the program did not achieve its goals. However, there are lessons to be learned from it. This paper contains some of my personal observations and opinions about that program. In addition, in large part because of the program, I had the opportunity to work with one large beef herd in which we were able to do substantial testing for several years. Our ultimate goal, to (virtually) eliminate paratuberculosis from the herd, has not been achieved. Yet the successes and failures are lessons for others. The following are thoughts concerning our experiences in Johne’s disease control programs in beef cattle.

It is necessary at the outset for me to define “beef cattle herds”. I learned when I began working with Johne’s disease on a national basis, that beef cattle in some states are managed similarly to dairy cattle at certain times of the year. Therefore, when I refer to “beef cattle”, I am referring to extensively raised beef cattle that spend almost the entire year on pasture land.

AIMS AND OBJECTIVES

The VBJCP is a nationally sanctioned program that is administered by the states for the control of Johne’s disease. Minimum program standards must be included in state programs in order for the state to participate in the federal funding opportunities. For a number of years, federal funds were made available to states through cooperative agreements (see Figure 1). Most of these funds were used for testing. State support for the program varied from nothing to a substantial amount.
Figure 1

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Federal Funds (millions)</th>
<th>Dollars to States (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>$1.5</td>
<td>$0</td>
</tr>
<tr>
<td>2001</td>
<td>$2.5</td>
<td>$0</td>
</tr>
<tr>
<td>2002</td>
<td>$2.7</td>
<td>$0</td>
</tr>
<tr>
<td>2003</td>
<td>$21</td>
<td>$12</td>
</tr>
<tr>
<td>2004</td>
<td>$18</td>
<td>$10</td>
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<tr>
<td>2005</td>
<td>$18</td>
<td>$8</td>
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<td>2006</td>
<td>$13</td>
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<td>2007</td>
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<td>$5</td>
</tr>
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<td>2009</td>
<td>$7</td>
<td>$2.5</td>
</tr>
<tr>
<td>2010</td>
<td>$7</td>
<td>$1.5</td>
</tr>
<tr>
<td>2011</td>
<td>$3</td>
<td>$0</td>
</tr>
</tbody>
</table>

With Federal funds came enthusiasm and participation by producers, especially dairy producers. The dairy industry understood the direct economic impact of the disease on their herds as well as the potential negative impact on sales if the association of MAP with Crohn’s disease was proven to be causal. The beef cattle industry did not recognize a substantial economic loss or a significant risk to sales of their product. Enthusiasm and participation by the beef cattle industry remained low except in a few states. Total herd enrollment went from 1,925 herds in 2001 to a peak of 8,818 herds in 2007.

Out of an estimated 740,000 beef herds in the USA, the peak of participation in the VBJDCP occurred in 2006 when 2,102 herds were enrolled in the program. Four years later only 45% of those herds remained enrolled. In 2007 a peak in participation of the dairy industry occurred with 6,797 of 75,000 herds enrolled. Three year later, 54% remained.

LESSONS LEARNED

Clearly, an infusion of money increased participation. The money was used to increase education, hire personnel to support and promote the program and to pay for or subsidize testing. The hypothesis was that after the program got a kick start with federal funds, the industry would realize the economic benefit of the program and it would become self-sustaining, funded by industry participants. This didn’t happen. When the money went, the participation went. Why? Feed prices? Milk prices? Other more critical problems facing the dairy industry? The insidious nature of the disease? The lack of tangible results from control programs? From the beef perspective, I think the reason the program never got off the ground is because the
economic loss to the beef cattle industry caused by Johne’s disease is small, and the cost of control is relatively high.

The fundamental control principal used in the dairy industry, separation of susceptible calves from infected manure, is not practical for beef cattle producers. Testing becomes more important because shedding cattle need to be eliminated from the herd. Because most infected beef herds are low prevalence herds, and because serologic tests have had less than perfect specificity and low sensitivity, it is very difficult to identify most infected cattle, and quite frequently, false positive tests occur. This is highly undesirable in purebred herds where the greatest interest in controlling the disease is present. Using antigen identification tests to eliminate false positive results substantially increases costs.

Nearly every beef cattle producer I know who participated in the program was a seedstock producer who was concerned about the legal and moral ramifications of selling infected cattle and not the potential economic impact of the disease on production. Therefore, reducing prevalence was not the main goal; eliminating the organism from the herd was the goal. With our current testing technology, elimination of the organism is time consuming and expensive if it is possible at all.

In states where the Designated Johne’s Coordinator (DJC) was personally active in education, promotion and testing in beef cattle, the programs grew. This usually occurred in states where the DJC had few or no other responsibilities outside of Johne's disease control. While free or nearly free testing helped, it was not the answer. In one state where the total support for testing was much less than it was in Texas, the number of beef herds in the program was much greater because of the time dedicated to the program by the DJC.

In Texas, where at one time we had sufficient funding to pay for all testing, sample collection, shipping and risk assessment, we had funds left over at the end of the year. Our DJC had several jobs in addition to Johne's disease control. Another belief held by the National Johne’s Working Group, the group who created and monitored the program, was that herds on the program could recoup the costs of control by selling replacement cattle at a premium. While some producers were able to market cattle at a premium, this advantage was not realized by many of the program participants.

**EXPERIENCES IN A LARGE BEEF HERD**

I have had the privilege to work on Johne's disease control with a large purebred operation for six years. The herd is divided into three herds with imperfect segregation. There are about 150 *Bos indicus* cattle, 50 *Bos taurus* and 400 crossbred recipient cattle. The purebred cattle were tested each year by serum ELISA and fecal culture. The recipients were tested by serum ELISA each year and fecal culture two years. The recipient herd was culled heavily based on the serum ELISA. The purebred cattle were culled only based on fecal culture. Results of the testing are in Figure 2.
The seroprevalence of the recipient herd dropped rapidly and stayed well below the initial level except in 2007 when a large number of low positive results were recorded. The seroprevalence dropped in the purebred herds as well, but least dramatically in the *Bos indicus* herd. The seroprevalence in the *Bos indicus* herd has remained almost five times greater than that of the other two herds. The high seroprevalence, particularly in *Bos indicus* cattle, has been shown to be associated with environmental mycobacteria in this region. Despite the greater seroprevalence and larger herd size of the *Bos indicus* herd, only four *Bos indicus* cattle have been culture positive while three *Bos taurus* cattle have been culture positive.

**SOME OBSERVATIONS**

1. A *Bos indicus* cow had a rising ELISA SP value for four years. She was culture negative for three years and a super shedder in the fourth

2. A *Bos taurus* cow had a strong positive ELISA for four years and was culture negative. MAP was isolated from her intestinal lymph nodes at necropsy

3. Well over half of the *Bos indicus* herd was raised by recipient cows

4. After six years, we have made no progress measured by the fecal culture prevalence. Had we culled the *Bos indicus* cattle on the basis of ELISA, we would have eliminated many tens of thousands of dollars’ worth of cattle that were not shedding MAP.

Although I was personally disappointed by the results, the owner was somewhat pleased by the low culture prevalence and the absence of clinical disease after the 1st year on the program. As an interesting anecdote, after couple of years of emphasizing the importance of the recipient herd and the importance of raising low risk recipients on the property, I finally cajoled the owner into raising his own replacements.
The owner decided to test a separate herd of lower quality *Bos indicus* cattle on a separate property that was used to produce F-1 heifers for sale. He decided that he could use some of the cattle produced in this herd as home-raised recipients. We tested these cattle and found a culture prevalence of about 4%. We concluded that buying beef cattle of unknown origin at an auction market was a lower risk than keeping heifers from this herd.
Johne’s disease control in Canada – coordinated nationally – delivered provincially

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INTRODUCTION

Johne’s disease has long been identified as an important production limiting disease of dairy cattle. In recent years, concern over public scrutiny of *Mycobacterium avium* subspecies *paratuberculosis* (MAP) as a potential zoonotic agent has brought the disease to the forefront among producers groups across the country. While programs targeted at Johne’s disease control have been developed and implemented provincially, the coordination of these programs at the national level remains an important issue to ensure some degree of uniformity of practice since cattle frequently move among provinces.

The Canadian Johne’s disease Initiative (CJDI) coordinates provincial Johne’s disease control activities across Canada. Since its inception in July, 2009 the CJDI, funded by Dairy Farmers of Canada and the Canadian Cattlemen’s Association has been guided by its Advisory and Technical Committees (each with representation from industry, veterinary schools, and provincial programs). The CJDI priorities are to increase education about and awareness of Johne’s disease across Canada among dairy producers, veterinarians and allied industries; to encourage the development and implementation of control programs in all of the 10 provinces of Canada and where possible to support coordination among these programs; and to facilitate the development and funding of research programs in areas that will support the coordinated mission of Johne’s disease control.

AIMS AND OBJECTIVES

Given that Johne’s disease control is being delivered at the provincial level (Canada has 10 provinces – each with an important dairy industry), the aim of this document is to describe the structure, similarities and differences among these dairy programs and to highlight some of the important lessons learned during the early stages of program implementation.

The objectives are:
1. To briefly compare the provincial dairy cattle programs in terms of key components, program administration, program delivery, status programs, testing and penetration.

2. To describe lessons learned through the initial stages of provincial program implementation.

PROVINCIAL PROGRAMS

Nine of the ten Canadian provinces now have voluntary Johne’s disease control programs in place. In most cases, the programs were producer initiated (in Québec the program was initiated by the provincial government, but with strong producer support) and are managed by committees that include producer group, provincial government, university, milk recording and veterinary association representatives.

Figure 1. below includes the year initiated, the anticipated duration of the program based on currently committed funding, dollars available and the principle organization(s) which initiated the program.

<table>
<thead>
<tr>
<th>Provincial Johne's Disease Initiative:</th>
<th>Year Initiated / Duration:</th>
<th>$ invested / to invest:</th>
<th>Initiative Partners:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quebec Voluntary Paratuberculosis Prevention and Control Program</td>
<td>2007 -</td>
<td>$1.6 Million</td>
<td>Government – Academia - Industry</td>
</tr>
<tr>
<td>Ontario Johne's Disease Education and Management Assistance Program</td>
<td>2010- 2014</td>
<td>$2.4 Million</td>
<td>Industry – Academia - Government</td>
</tr>
<tr>
<td>Manitoba Johne's Disease Initiative</td>
<td>2010 - 2013</td>
<td>$175,000</td>
<td>Government - Industry - Academia</td>
</tr>
<tr>
<td>Alberta Johne's Disease Initiative</td>
<td>2010 - 2013</td>
<td>$730,000</td>
<td>Industry – Academia – Government</td>
</tr>
</tbody>
</table>
Atlantic Canada includes Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland and Labrador.

All of the programs have four key elements in common. These include education of producers, veterinarians and the public, an on-farm risk assessment administered by a veterinarian, testing at either the herd and/or the cow level, and applied research.

Details of each provincial program can be found on their respective websites:

Canadian Johne’s Disease Initiative:
http://www.animalhealth.ca/Programs/Detail.aspx?id=24


Atlantic Provinces: http://www.atlanticjohnes.ca/


Ontario: http://www.johnes.ca/

Québec: http://www.mapaq.gouv.qc.ca/fr/Productions/santeanimalc/maladiesanimales/paratuberculose/

Education about MAP, including its spread and control, is central to all of the provincial initiatives. Ranging from traditional forms of delivery (articles in magazines and journals and presentations at conferences and meetings) to novel approaches such as small group facilitated self-directed learning, this is a core element that is critical to the success and long term viability of each of these programs.

The Animal Health Risk Assessment and Management Plan (RAMP) is a questionnaire that guides the herd veterinarian and the producer through a step-by-step assessment of calving, calf

<table>
<thead>
<tr>
<th>Provincial Johne's Disease Initiative:</th>
<th>Year Initiated / Duration:</th>
<th>$ invested / to invest:</th>
<th>Initiative Partners:</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Columbia Johne's Disease Initiative</td>
<td>2011 – 2013</td>
<td>$100,000</td>
<td>Government - Industry - Academia</td>
</tr>
<tr>
<td>Saskatchewan Johne's Disease Working Group</td>
<td>Periodic meetings</td>
<td>_</td>
<td>Government - Academia – Industry</td>
</tr>
</tbody>
</table>

¹Atlantic Canada includes Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland and Labrador
raising and hygiene practices associated with good calf and cow health, and excellent milk quality. The goal is to identify risk factors that could allow MAP from a shedding cow to infect calves on the farm. After completing the questionnaire (risk assessment), the producer and the veterinarian decide what can and will be done in the next year to mitigate some of the identified risks as part of developing the “management plan”. Generally, acceptance of recommendations is good when producers realize that steps taken to reduce new MAP infections will also reduce other calf diseases caused by fecal-orsally transmitted pathogens.

The RAMP is the most uniform component of the provincial programs, at least in part because there is a national standard for process that was developed by CJDI technical committee. Each provincial program has adhered to the standard, although the method of delivery does vary. Since private veterinary practitioners are conducting these assessments, training becomes an important component of the overall program. Methods used to train veterinarians ranges from one-on-one training to group training to on-line web-based methods.

While all of the Canadian programs have a testing component, the approach and test(s) used vary, as do the monetary incentives/subsidies to test. Some programs utilize environmental testing alone or in combination with individual cows testing, while others are based solely on individual cow test results. Cow tests in use include milk ELISA, serum ELISA, fecal culture and fecal PCR. In each case the testing is done through either the provincial or regional diagnostic laboratory or the Dairy Herd Improvement (DHI) milk recording laboratory, all of which are accredited for the tests they are offering. The way these test results are used by the program and the veterinarians/producers varies among provinces, and details can be found on the respective program websites.

Many dairy producers who participate in these voluntary control programs and have therefore demonstrated a desire to control Johne’s disease in their herd wish to have their efforts recognized. They also want to know how other herds in the country compare, particularly if they are in need of purchasing replacement animals for their herd. To meet this demand, most of the provincial programs have either a status or recognition program. In some cases the program simply issues a certificate of completion once a herd has met all of the program requirements, while others have a more complex status system which distinguishes among herds and recognizes herds of different Johne’s disease risk. Given that cows are frequently bought and sold, and that they move within and between provinces, there is a need to harmonize these status programs.

The other major concern among dairy producers is the disposition of test-positive animals. Again, the programs vary in how they deal with animals identified as being test-positive with any of the approved test methods. For instance, in Québec all producers who wish to access their individual cow test results must sign an affidavit stipulating that they will not sell any test positive animals. This restricted animal movement is enforced through a provincial animal traceability
program that is unique to Québec at this time. On the other hand, Ontario participants who
wish to qualify for program funding support must remove all cows found with high titre (HT)
tests (based on the milk ELISA test currently in use a positive test result is 0.1 or greater, while a
High Titre is 1.0 or higher) NOT to another dairy herd or to the food chain, within 90 days of
the testing date. Producers who remove these HT cows as required by the program receive $500
per cow to assist with on-farm changes to prevent MAP spread.
All of the provincial programs have associated research activities focused on Johne’s disease
control. Some of the programs fund research directly from their operating budgets, while others
make program dollars available to researchers for provincial and federal matching fund
applications. The research programs are generally coordinated by faculty at the local/provincial
veterinary colleges. These researchers gather annually at a relatively informal research
conference where progress is presented and new ideas for collaborative research are developed.

LESSONS LEARNED

Many of the challenges posed by Johne’s disease and its control relate to the long period of time
between exposure to MAP and development of clinical disease, and the generally poor
performance characteristics of the tests currently available for indentifying infected individuals.
As direct consequence of these challenges, it is imperative that veterinarians and producers
understand the implications and the terminology used in discussing Johne’s disease control. For
instance, there is generally a poor understanding of the difference between a ‘test-negative’ herd
and a ‘Johne’s free’ herd. Perhaps it is not surprising, given that our previous disease control
programs have focused on Brucellosis and Tuberculosis, disease which we have been successful
in eradicating with a ‘test and cull’ strategy. During the active stages of these eradication
programs herds were tested annually and designated ‘test-negative’ herds as ‘free’ of disease. The
fact that we test herds for Johne’s disease and are not willing to call ‘test-negative’ herds ‘Johne’s
free’ has confused producers and dairy industry advisors. We need to continue to educate all
participants about this important distinction.

The introduction and training of veterinarians to deliver the RAMP has proven to be a great
success. The private practitioners have been instrumental in recruiting participants and giving
credibility to the programs. Veterinary involvement in the RAMP facilitates a discussion
between the herd veterinarian and the dairy producer about important areas of the dairy
enterprise (calving hygiene and calf rearing) which have largely been ignored on many farms.
Deficiencies identified during the process are often easily corrected and generally lead to an
overall decreased risk of calves contracting a number of important diseases transmitted fecal-
orally. There is anecdotal evidence that the implementation of changes as a result of the RAMP
assessment are contributing to a reduction in other endemic diseases including calf diarrhea.
Given the current focus on biosecurity among all livestock and poultry industries, the Johne’s
disease control programs are proving to be very effective examples of implementation of
targeted biosecurity on dairy farms across the country.
One of the most striking differences among the provincial Johne’s disease programs is the approach to testing. These differences have been noted and the details for each program are described on the respective websites. These differences in testing have prompted many discussions among researchers, veterinarians and producers. While there clearly is no ‘best’ approach, the dialogue about the various strengths and weaknesses has contributed to the understanding of the limitations of testing in general, and has prompted further collaborative research evaluating tests and test strategies. Probably the biggest lesson that needs to be learned by most dairy producers is that by simply testing and culling test-positive cows, the disease cannot be simply eradicated. The notion that false-negative test results are common when testing individual animals with milk or serum ELISA, or fecal culture/PCR is unsettling at best.

A key element that has been continuously emphasized by dairy producer representatives sitting on our management committees is the importance of NOT allowing MAP infected cows to move freely from one herd (region) to another, and effectively spread the disease. While enforcement of movement restriction is currently limited to the province of Québec, the importance of educating dairy producers who must buy replacement cattle to ask about the health status of potential herd additions (Buyer Beware) needs to be a constant message.

The final lesson and challenge relates to the voluntary participation in the various programs. Given that these programs are producer initiated, the early enthusiasm drives uptake in the first year or two, but with time many of the programs suffer from decreased profile, decreased interest and decreased participation. The challenge is to find new ways to keep the program fresh, keep it prominent in the minds of producers and to generate messages that bring the sceptics and late adopters on board.
PCR surveillance of paratuberculosis and a future strategy for the disease control with quantitative real-time PCR in Japan

Yasuyuki Mori, Reiko Nagata and Satoko Kawaji
National Institute of Animal Health, Japan

INTRODUCTION

The detection of Mycobacterium avium subsp. paratuberculosis (Map) DNA from faecal samples by the quantitative real-time PCR (qPCR) seems to be crucially important as a rapid diagnosis of paratuberculosis, because infectious cattle continues to excrete a large amount of Map into faeces, and causes environmental contamination with Map during a time-consuming bacterial culture test. We have developed the sensitive and specific qPCR test for the diagnosis of paratuberculosis, and have performed an inter-laboratory validation of the qPCR assay and the surveillance of bovine paratuberculosis by the qPCR.

THE QPCR FOR THE DETECTION OF MAP

One of the important steps in order to perform sensitive and reliable qPCR is to efficiently extract and purify the Map DNA from faecal samples, we have developed therefore the Map DNA extracting and purifying reagents kit, which is already commercially available in Japan. Map DNA is extracted and purified from faeces by the kit, and Map specific DNA fragment of IS900 is amplified and calculated the concentration of Map DNA by the qPCR. The both of specificity and sensitivity of the qPCR are extremely high, 1 fg of Map DNA can be detected from faecal DNA samples, and no cross-reactions have been observed with mycobacterium species other than Map. The qPCR surveillance were performed at livestock hygiene laboratories of 23 prefectural governments. As shown in Table1, 456 (10.4%) of 4,391 fecal samples collected mainly from daily cattle were qPCR positive, and 264 (6.0%) were Map culture positive. In contrast, 855 faecal samples obtained from the herds without paratuberculosis history were all qPCR negative.

DIAGNOSTIC METHODS IN THE JAPANESE PARATUBERCULOSIS CONTROL MEASURES

Paratuberculosis is one of the diseases designated by the Domestic Animal Infectious Disease Control Law in Japan, and it must be diagnosed based on the officially approved diagnostic methods.

Followings are currently approved methods by the Law, however they still have some problems to be improved.

- Map culture: Time consuming, negative results with contamination
- ELISA, CF: Non-specific reactions, positive at late stage of infection
- Johnin skin test: Non-specific reaction, low sensitivity.

Although the qPCR results did not indicate 100% positive for all of the Map culture positive faeces, the positive rate of qPCR in faecal samples from the herds with paratuberculosis history
were much higher than that of Map culture as shown in Table 1. The specificity of the both assays are comparable, however the qPCR seems to be more suitable in terms of the rapid detection of Map.

The recent number of cattle diagnosed as paratuberculosis based on the Law are around 500 per year in Japan, and a large part of these cattle has been diagnose by ELISA tests. However, as mentioned above ELISA has a problem in terms of specificity, and we have recently experienced several cases of nonspecific ELISA positive in the herds where all cattle are negative by the qPCR test. In consideration of these conditions, we are planning to obtain the official approval of the qPCR assay as one of the diagnostic methods for paratuberculosis, and change to the new diagnostic criteria mainly based on the qPCR.

Table 1

<table>
<thead>
<tr>
<th>Map culture</th>
<th>qPCR</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>+</td>
<td>237</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>(89.8%)</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>219</td>
<td>3,908</td>
</tr>
<tr>
<td>Total</td>
<td>456</td>
<td>3,935</td>
</tr>
<tr>
<td></td>
<td>(10.4%)</td>
<td></td>
</tr>
</tbody>
</table>

*Percentage of qPCR +ve/Map culture +ve

Table 2. All of the fecal samples from Map-free farms were negative in the qPCR.

<table>
<thead>
<tr>
<th>Herds</th>
<th>No. of positive /No. of tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0 / 26</td>
</tr>
<tr>
<td>B</td>
<td>0 / 30</td>
</tr>
<tr>
<td>C</td>
<td>0 / 380</td>
</tr>
<tr>
<td>D</td>
<td>0 / 72</td>
</tr>
<tr>
<td>E</td>
<td>0 / 267</td>
</tr>
<tr>
<td>F</td>
<td>0 / 40</td>
</tr>
<tr>
<td>G</td>
<td>0 / 40</td>
</tr>
<tr>
<td>Total</td>
<td>0 / 855</td>
</tr>
</tbody>
</table>
Exploring the options for a Johne’s disease dairy risk management scheme in New Zealand

H. Voges¹, L. Burton²

¹Livestock Improvement Corporation, Hamilton, New Zealand
²Fonterra Cooperative Group, Morrinsville, New Zealand

BACKGROUND INFORMATION

The New Zealand dairy industry is based on pasture grazed by cows as the primary feed source in an industry that is highly seasonal with greater than 90% of cows calving outdoors on pasture in the spring period. Because of the temperate climate the majority of animals are kept on pasture. All year round housing of animals is very rare, although cows may be managed on ‘stand-off’ pads for a period in the winter primarily to limit pasture damage by treading and to maximise feed utilisation in wet conditions. During the last 15 years significant growth of the industry has occurred in the central and lower South Island where irrigated pastures as well as winter crops, predominantly brassicas, are used as a significant supplementary feed source. Increasing use is also being made of supplements like PKE and grains to meet feed deficits in the winter and spring period.

Key statistics (NZ Dairy Statistics 2010-11 www.dairynz.co.nz/page/pageid/2145866855/New_Zealand_Dairy_Statistics) for the industry are:

- 11,700 herds
- 4,500,000 cows
- Average farm size - 140 hectares
- Average herd size - 386 cows
- Average production per herd - 129,000 kg MS
- Average production per cow - 334 kg MS
- Peak milk collection 81,000,000 litres
- Annual milk collection 14,700,000,000 litres
- >90% is processed into manufactured products for export.
The milk flows from seasonal production system are illustrated below in figure 1:

**Figure 1**

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**MANAGEMENT STRATEGIES ‘UNIQUE’ TO THE NEW ZEALAND DAIRY INDUSTRY**

To achieve an optimal fit of pasture feed availability with demand a 365 day inter calving interval is maintained. Typically more than 80% of the herd will calve within an eight week period during the spring period.

Of particular importance when considering the control of paratuberculosis are:

- Cows are calved outdoors on relatively confined areas of pasture where cow density is high. New daily allocations of pasture are made to cows about to calve but the level of soil and faecal contamination of animals including udders can be significant particularly during rainy periods

- Calves are removed from cows within 24 hours of birth and initially reared in indoor housing facilities with group pens

- Colostrum is routinely pooled and fed to newly born calves. A key management recommendation is to feed all calves with fresh pooled colostrum at the time of arrival in the calf rearing facility

- Surplus colostrum is stored and fed to calves during the rearing period
• Over 90% of replacement heifer calves reared will be grazed off the dairy production unit after weaning. These are generally located on specialist dairy heifer grazing farms where the majority of cattle are likely to be less than two years of age. The dairy replacement heifers return to the milking farm at approximately two years of age - normally just prior to calving.

• Traditionally calves were set-stocked at 2-3 heifers per paddock and spread across the home farm for rearing. This is still practiced by a minority of herds.

• The milking herd is managed as one or more mobs and rotational grazing is practiced on pasture.

• The majority of effluent collected the milking shed is collected in an effluent pond and then irrigated onto the pasture. The area of farm spray irrigated with effluent ranges between 15 - 40% of the land grazed by the milking cows. The interval between application and grazing is usually greater than seven days.

• Very few farmers would have any knowledge of the Johne’s disease status of individual cows in the herd even though clinical evidence of disease is present in many herds. Johne’s disease testing of cattle is not routinely carried out.

• The Johne’s disease status of individual animals or herds is generally not a consideration when farmers are purchasing capital stock.

• A unique feature of New Zealand dairying is the ‘Sharemilking’ structure which means that only 65% of dairy herds belong to the farm owner. A 50:50 sharemilker owns the dairy herd and typically enters a 3-year contract with the farm owner after which the sharemilker may move to another property with the herd.

JOHNE’S DISEASE PREVALENCE IN NEW ZEALAND DAIRY HERDS

Norton et al in 2009 described the clinical incidence of Johne’s disease in dairy herds to be <0.5%, as reported by farmers and their veterinarians in response to a survey. In a more recent farmer survey undertaken by Heuer et al, 2011, the following information was obtained.

*Percentage of farmers reporting the occurrence of confirmed or suspected clinical Johne’s disease during the previous three years*

(1940 survey farms, JDRC epidemiology survey 2008 -10)
### Figure 2

<table>
<thead>
<tr>
<th>Species</th>
<th>No. Farms</th>
<th>Confirmed JD</th>
<th>Suspected JD</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deer</td>
<td>237</td>
<td>18%</td>
<td>17%</td>
<td>35%</td>
</tr>
<tr>
<td>Dairy cattle</td>
<td>614</td>
<td>19%</td>
<td>3%</td>
<td>22%</td>
</tr>
<tr>
<td>Sheep</td>
<td>1257</td>
<td>5%</td>
<td>9%</td>
<td>14%</td>
</tr>
<tr>
<td>Beef cattle</td>
<td>1265</td>
<td>2%</td>
<td>2%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Analysis of national cow records over a ten year period by Voges in 2009, similarly showed within-herd culling rates of 0.4-0.5% per annum. However only 8.5% of all NZ dairy herds recorded Johne’s incidence. The data revealed significantly higher risk amongst Jersey cows compared with Holstein-Friesian (RR = 4.26).

However despite a lack of any coordinated Johne’s control efforts with limited testing and also continued “high-risk” management practices such as communal calving areas and pooled colostrum feeding, recorded Johne’s culling rates remained almost static over the ten year period.

Regional differences in Johne’s disease culling rates suggest that different risk factors may come into play. Voges (2009) demonstrated that Johne’s rates are relatively high in Taranaki and Westland – both Jersey strongholds – but also in the rest of the South Island, particularly Canterbury. This was borne out by the results of a recent large-scale vat screening round (see below). Rapid expansion of dairying in the South Island is resulting in an increased awareness of Johne’s disease especially amongst veterinarians and farmers.

### STRAIN TYPING

A VNTR-SSR based strain typing system developed in 2008-2010 was used to classify 200 dairy cattle and 150 beef, sheep and deer isolates. The results are significant, in that they indicate trends in infection previously unseen in New Zealand. Of the 20 Type C and 8 Type S sub-strains identified, one Type C sub strain is predominant in dairy cattle, while a different type C sub strain is predominant in deer and a single type S sub-strain is common in sheep. But surprisingly a number of cattle were also infected with type S strains. The significance of this finding is yet to be understood. There is also evidence of individual dairy cattle being infected with multiple strains of MAP.
PROPOSED JOHNE’S DISEASE CONTROL STRATEGIES FOR NEW ZEALAND DAIRY HERDS

While it is important to ensure that changing management practices (eg herd amalgamation and intensification may have unforeseen consequences) do not result in a rise in within herd MAP prevalence. However, extensive test-and-cull or Johne’s control programs for all herds irrespective of Johne’s disease status are unlikely to be effective and quite possibly counterproductive. To maximize the effectiveness of any control strategies, we therefore propose that interventions need to be targeted particularly against the risks in herds with the highest Johne’s disease incidence and risks. In the majority of New Zealand herds, MAP infection is at a very low level and of little consequence.

While many risk factors are well known and studied, it is important to understand their importance and impact under New Zealand conditions as well as possibly NZ-specific factors. To help identify practical and effective interventions, scoping is underway for an intervention study for New Zealand dairy herds.

To identify high Johne’s disease risk herds and monitor their progress, various diagnostic tools are required such as effluent monitoring. Data presented by Voges et al in 2009 suggests that primary vat milk screening by ELISA may offer a relatively cheap but highly effective method to identify herds of interest. That test validation under NZ conditions confirmed the previous findings by van Weering et al (2007) showing a high correlation between the Pourquier (IDEXX) indirect Johne’s ELISA and individual ELISA sero-prevalence. An ELISA result S/P > 0.10 indicates 3% or greater sero-prevalence (5% on average in the validation study). Herds with S/P >0.05 are expected to have >1.5% sero-prevalence (mean 2%).

Screening of over 3000 herds recently across New Zealand as part of a genomic study gives some indication of likely rates of high-risk herds:

<table>
<thead>
<tr>
<th>Vat Milk ELISA result</th>
<th>Presumptive sero-prev</th>
<th>North Island</th>
<th>South Island</th>
<th>National NZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>S/P &gt; 0.10</td>
<td>5% (3.0%+)</td>
<td>1.3%</td>
<td>1.6%</td>
<td>1.3%</td>
</tr>
<tr>
<td>S/P &gt; 0.05</td>
<td>2% (1.5%+)</td>
<td>3.9%</td>
<td>10.2%</td>
<td>5.1%</td>
</tr>
<tr>
<td>'high-risk'</td>
<td>&gt; 1.5%</td>
<td>5.2%</td>
<td>11.7%</td>
<td>6.5%</td>
</tr>
<tr>
<td>total herds</td>
<td></td>
<td>2564</td>
<td>640</td>
<td>3204</td>
</tr>
</tbody>
</table>

Figure 3
The data also confirms the regional differences identified by the culling data. The higher levels of MAP infection and Johne’s incidence rates in the South Island serve as a warning that changing management practices and expansion of dairy farming in that area may undesirable consequences for the New Zealand dairy industry overall with respect to Johne’s disease.

Finally, given that on-farm costs of Johne’s disease may be difficult to quantify or hidden, a voluntary user pays scheme for individual producers is unlikely to result in effective MAP risk reduction on a national basis. The New Zealand dairy industry has jointly instituted and run a highly successful EBL control scheme, ensuring excellent compliance across the industry. It is envisaged that dairy processors will have an important role to play in any successful risk management scheme.

REFERENCES


Lessons from the implementation of BJD management strategies in the Australian dairy industry

Robin Condron¹ and David Basham²

¹Dairy Australia
²Australian Dairy Farmers Limited

Australia has had considerable success in eradicating several important cattle diseases in the 20th century including pleuropneumonia, tuberculosis and brucellosis. This required considerable resources and resulted in the establishment of major animal health capability for the control of infectious diseases but approaches to manage Bovine Johne’s Disease (BJD) need to be different. In 2003 a new approach to manage BJD was adopted by industry peak bodies and animal health authorities in Australia. The new National Strategic Plan involved more emphasis on industry-led voluntary measures and less regulated approach through cooperation of farmers, animal health authorities, dairy processors and government agencies.

The goals of the national approach are to reduce contamination of farms and farm products by Mycobacterium paratuberculosis to protect the status of non-infected herds and regions and to reduce the social, economic and trade impact of BJD. Due to decades of regulatory controls for BJD, Australia is in a favourable situation in comparison to other countries, as endemic Johne’s disease is restricted to south-eastern Australia and in affected dairy herds BJD occurs at a low prevalence. The different disease prevalence between beef and dairy sectors and different regions of Australia is taken into account in the control strategies for the dairy and beef sectors.

AUSTRALIAN DAIRY INDUSTRY BJD PROGRAM

The Australian dairy industry has a high priority for the management of BJD in Australia. This is driven by a precautionary approach that a public health risk caused by M. paratuberculosis may be confirmed in the future. The industry has undertaken risk analysis for M. paratuberculosis in milk which identified that the likelihood of M. paratuberculosis in dairy products was very small and that the most significant factors to reduce the risk were the effectiveness of heat treatment of milk and the prevalence of M. paratuberculosis infection in dairy cattle.

Research studies confirmed pasteurisation is highly effective in inactivating M. paratuberculosis and processing controls were introduced. Negative results were obtained from a survey of raw and processed milk which involved a sample size which provided 95% confidence of including at least one positive result if 0.5% of samples containing M. paratuberculosis at detectable levels.

To achieve uptake and improve the voluntary management of BJD and its effects across the whole dairy industry, the emphasis has been on:

- Improving all farmers’ and advisors’ understanding of BJD and its management
- Implementing systems that allow better risk-based trading of cattle and land
• Managing BJD better on farms through market-driven quality assurance programs
• Reducing contamination of raw milk and the environment with *M. Paratuberculosis*
• Developing testing methods to monitor infection/contamination levels in all herds.

**IMPROVING UNDERSTANDING OF BJD**

The dairy industry has progressively implemented a national communication and training program under the banner “BJD Aware”. Communication tools for farmers and advisors have been widely distributed and are available on the Dairy Australia website.

Evaluation of the training for industry service providers was undertaken to remind them of the importance of BJD control measures and to identify areas for improvement. Barriers for farmer adoption of recommended practices were a lack of understanding and confusion in assessing risk assurance measures and movement restrictions. There was a willingness to support the industry approach but a reluctance to take a proactive role. The study revealed livestock agents were having a negative influence and further direct engagement was successfully implemented. An evaluation of the progress of the BJD Test and Control Program has identified opportunities to improve the information provided by the supervising veterinary surgeons.

**SYSTEMS FOR BETTER RISK-BASED TRADING**

The National Dairy BJD Assurance Score (Dairy Score) was developed to rank the status of cattle based on available information from BJD control measures. The Dairy Score provides guidance about how BJD assurance can be improved and underpins the voluntary risk-based trading systems for farmers to better manage the risk of BJD with herd introductions.

Use and understanding of the Dairy Score is improving and the tool provides incentives for the adoption of recommended control measures, testing to a lower prevalence and implementation of hygienic calf rearing. Mandatory declaration of the Dairy Score for vendors has been introduced in some states as a move to differentiate and manage risk between cattle sectors. There is continuing pressure to simplify the Dairy Score on one hand and to provide guidance for all specific circumstances on the other.

Further adoption and use of Dairy Score will be dependent on market uptake by buyers of cattle seeking assurances rather than imposing requirements on vendors. This is being addressed by incorporating BJD controls as part of the recommendations in industry biosecurity extension strategies.
Figure 1

NATIONAL DAIRY BJD ASSURANCE SCORE

HERD TESTING PATHWAY

CattleMAP MN3 10
CattleMAP MN2 9
CattleMAP MN1 8

HYGIENIC CALF REARING PATHWAY

Check Tested
 Tested to MAP standard 7 Cattle eligible for calf credits

Restricted Stage 2 6 Cattle eligible for calf credits
Restricted Stage 1 5 Cattle eligible for calf credits

Tested Low Prevalence 4 Approved Hygienic Calf Program (Implemented for 4 years or more)
Tested Moderate Prevalence (Non-Assessed before July 2008) 3 Approved Hygienic Calf Program (Implemented before July 2008)
Tested High Prevalence 2 Approved Hygienic Calf Program

Infected or Suspect 1 Approved Hygienic Calf Program

Non-Assessed (After July 2008) 0

Further Testing & Management

Has an approved control program been implemented?

Implement an approved hygienic calf program

Test & Resolve Status

1 No Action

No Action

No

YES

CattleMAP CattleMAP

Control Program

Infected

Suspect

Non-Assessed
MANAGING BJD BETTER ON FARMS

A major focus has been on the implementation of hygienic calf rearing being universally included in on-farm quality assurance programs and in State test and control programs. Communication and follow-up with the industry quality assurance programs has been very important. Evaluation of the uptake has been conducted in several farmer surveys. Most farmers recalled the BJD communication materials and found them to be useful. There was a high awareness of the “3 Step Calf Plan” and adoption of the recommended measures even when farmers were not aware of the Plan.

The “3 Step Calf Plan involves: 1. Calves should be taken off the cow within 12 hours of birth. 2. Management of the calf rearing area should ensure no effluent from susceptible species comes into contact with calves. 3. Calves up to 12 months old should not be reared on pastures that have had adult stock or stock that are known to carry BJD on them during the past 12 months. The JD Calf Accreditation Program (JDCAP) which is a requirement of the Victorian Test and Control Program has more rigorous specifications and guidance.

Reasons for non-compliance with the recommended measures included: “I don’t have BJD”, No land to segregate young stock, “Calves do better if left with mothers longer”. Large and medium sized farms had better adoption of “3 Step Calf Plan”. The survey conducted in 2009 indicated that the stigma of BJD was less for 30% of farmers and only 15% of farmers indicated the stigma of BJD was increased.

Figure 2
REDUCING CONTAMINATION OF RAW MILK

Detection of *M. paratuberculosis* in bulk vat milk was rare in research undertaken to evaluate the testing of milk to identify high risk infected herds. These results are attributed to the low prevalence of infection and the priority given to hygienic milk harvesting through the industry mastitis extension program “Countdown Downunder”.

DEVELOPMENT OF TESTING METHODS

Only limited opportunities were identified from testing bulk vat milk but culture of environmental samples collected as composite faecal samples from the dairy yard after milking have revealed a remarkable sensitivity, with positive results from about 50% of infected herds in a single test and 80% in herds with seroprevalence >3%.

The Herd Environmental Culture (HEC) test has been adopted in national BJD programs as an alternative assurance test to an ELISA of 50 cattle. Although there are delays in obtaining results, there are savings in costs and the results are highly specific. Further work is in progress for the use of the HEC test in monitoring BJD control.

CONCLUSION

Strategies to manage and control BJD in the Australian dairy industry are continuing to evolve. They need to be cognisant of the different risks for different cattle sectors and regions and the risk appetite of individual producers. This has led to the development of a compartment strategy in the revised National BJD Strategic Plan which is about to be implemented.

The move to industry-led voluntary programs from a mandated regulatory approach and improved understanding of available risk management opportunities has removed the “dark side” of BJD and has resulted in a more open and willing attitude of farmers in relation to BJD management.

In order to ensure uptake of voluntary programs understanding how to influence behaviour and the barriers to adoption and are very important. Better information, incentives and inducements to do the “right thing” replace penalties and restrictions of the old paradigm. This is particularly relevant in Australia where clinical Johne’s disease is now uncommon and there is a lack of economic drivers for BJD control.
Lessons learned from the control of Johne’s disease in the Victorian cattle herd

Cameron Bell

Department of Primary Industries, Bendigo, Victoria, Australia

INTRODUCTION

The state of Victoria, located in the south east of mainland Australia, produces approximately 20% of Australian beef and 65% of Australian milk. There are currently approximately 4,200 dairy herds and over 10,000 beef herds present in Victoria.

Bovine Johne’s disease (BJD) is endemic in the dairy cattle population in south eastern Australia, with at least 25% of dairy herds in Victoria known to be, or suspected of being, infected. In contrast, BJD is uncommon in beef herds in this region.

Since 1994, Victoria has maintained a BJD control program that has been based on various combinations of regulatory, administrative, on-farm management and extension activities. Voluntary risk-based trading and on-farm management programs (e.g. hygienic calf rearing and test and control programs) are key elements of the current approach used in Victoria.

Johne’s disease in the Victorian cattle herd is managed through a partnership between the Victorian state government’s Department of Primary Industries (DPI) and the state cattle industry. These partners have jointly invested significant time, effort and resources into managing BJD.

AIMS AND OBJECTIVES

The management of BJD in Victoria is guided by a National Bovine Johne’s Disease Strategic Plan (NBJDSP) and Standard Definitions and Rules (SDRs) developed jointly by the cattle industry and state, territory and Australian governments. Victoria actively participates in the development of national BJD policies and procedures.

The goals of the NBJDSP are:

1. Minimise contamination of farms and farm products by Mycobacterium paratuberculosis
2. Protect non-infected herds whilst minimising disruption of cattle
3. Minimise the social, economic and trade impact of BJD at herd, regional and national levels.
LESSONS LEARNED AND IMPROVEMENTS MADE

A voluntary test and control program (TCP) based on regular individual animal serological testing has been available for infected cattle herds since 1996; herds enrolled in the TCP have primarily been dairy herds. A willingness to undertake regular reviews and revisions of the TCP has provided continuous improvement. Revisions have included adjustments to testing regimes, level of subsidisation and administration arrangements.

Because of the substantial costs associated with implementing a TCP, it has been necessary for the Victorian program to be jointly funded by both state industry and government, and this has required close cooperation by both parties. This has been achieved by the cattle industry and DPI, along with representatives of veterinary practitioners and the dairy industry, actively participating in advisory committees. The DPI has provided regular reporting to stakeholders to ensure they remain informed.

Until 2010, the TCP was administered by locally-based DPI field staff. Centralisation of TCP administration by DPI in 2010 has proven to be a more efficient, convenient and consistent approach.

Subsidised testing for the TCP has previously ceased before the infected status of herds was completely resolved. This is believed to have been a disincentive for herd owners to self-fund the final testing required to resolve herd status. In 2012, the TCP3 will be modified to include subsidised testing until the status of infected herds is completely resolved to encourage herd owners to complete the resolution of their herd status.

For herds participating in the TCP3, approved private veterinarians are responsible for providing professional advice on disease management strategies including hygienic calf rearing, herd testing and the identification and management of cattle that test positive for BJD. This approach has worked well as private veterinarians are ordinarily consulted by herd owners for other animal health issues, and hence they will have a good working knowledge of affected herds and their management.

For infected beef herds, Victoria has supported the National BJD Financial and Non-Financial Assistance Package since 2004. This program, funded by the national beef cattle industry, provides financial and non-financial assistance to affected herd owners. Key to the success of this program has been the provision of independent BJD counsellors who facilitate discussions between the affected producer, the producer’s veterinarian and local DPI staff, encouraging all players to work together closely as a team to achieve the desired outcome of the herd owner.

Hygienic calf rearing (“3 Step Calf Plan”) in the dairy sector has been incorporated universally into on-farm quality assurance programs overseen by milk processors. Victoria has also implemented the Johne’s Disease Calf Assurance Program (JDCAP) which provides more rigorous specifications and supervision. The JDCAP, open to all dairy herds, is a mandatory requirement for herds enrolled in the TCP3.
Voluntary risk-based trading systems are promoted for both the dairy (National Dairy BJD Assurance Score) and beef (Beef Only) sectors in Victoria. Promotion of the use of such voluntary programs, particularly to buyers of cattle, requires an ongoing effort from not only DPI, but also the livestock industry, including stock agents, dairy processors and industry peak bodies.

Both the Victorian cattle industry and DPI have actively supported research and development of diagnostic tests and other control methods for BJD, such as vaccination. Such involvement ensures appropriate technical expertise is maintained in Victoria.
An industry and government cooperative approach to managing Bovine Johne's Disease in the dairy industry in South Australia

Jeremy Rogers¹, Peter Nosworthy¹ and Greg Gilbert²

Primary Industries and Regions, South Australia¹,
Greg Gilbert, Lion Dairy and Drinks, Thebarton, South Australia²

INTRODUCTION

Prior to 2005 cattle herds infected or suspected to be infected with Bovine Johne’s Disease (BJD) in South Australia were quarantined, and a Test and Slaughter program instituted on farm. In South Australia the dairy industry is predominantly pasture based grazing systems, and some limited surveys had identified that the major source of BJD was located in the dairy industry, and other cattle associated with that industry.

The Quarantine and Test and Slaughter policy resulted in reluctance to report or diagnose suspect BJD on farm, and an antagonistic relationship in some cases between affected producers and Primary Industry and Regions South Australia (PIRSA).

During 2004 a Dairy Assurance Score was developed at a national level and agreed by all jurisdictions, and in 2005 South Australia adopted the use of this score in a voluntary Quality Assurance based management program called “Dairy ManaJD”. This program was developed in South Australia as a cooperative exercise between Milk Processor companies, the SA cattle industries (beef and dairy), PIRSA and Animal Health Australia (AHA).

Dairy ManaJD was seen as an accompanying program to the existing dairy processor Food Safety programs. It was based on the Hazard Analysis and Critical Control Points (HACCP) structure used in Food Safety Quality Assurance (QA) programs, but was entirely voluntary. The advantage was that dairy farmers were already familiar and comfortable with their Food Safety programs, and their annual audits and auditors. However, both government and private veterinarians had to make a leap of faith to embrace a voluntary QA system.

The SA cattle industries (as represented by the SA Cattle Advisory Group (SACAG) identified that there was under reporting of BJD in SA, and that this represented a risk of spread to the Beef cattle population. BJD infection in beef cattle herds involves substantial financial penalties due to loss of trade opportunities.

AIMS AND OBJECTIVES

SACAG agreed to fund the pilot Dairy ManaJD program for a period of three years to enable:

• Voluntary herd tests for dairy herds to enable a meaningful Dairy Assurance Score to be achieved in participating herds. Herds found to be infected with BJD would not be quarantined provided that they maintained enrolment in the Dairy ManaJD program
Participating herds agreed to the requirements of the Dairy ManajD Manual, including testing (and removal / clarification of ELISA reactors), improved calf rearing, and auditing of the program.

Private vets were subsidised by SACAG to manage enrolled herds, conduct testing and provide advice to the herd managers.

Milk processor companies agreed to provide an external oversight and auditing role (free of charge) that would be reported back to supervising veterinarians via PIRSA.

PIRSA managed the funding of the program on behalf of SACAG, managed the program in South Australia, provided technical advice to farmers, veterinarians and processor representatives, and issued an annual Certificate of Dairy Score to participating farmers.

PIRSA arranged a number of regional meetings throughout the dairying areas of SA to describe the new Dairy ManajD program, and SA government policy.

ACHIEVEMENTS 2004 to 2011

Initial projections and budgets were designed at achieving 30% enrolment in the Dairy ManajD program in a 3 year period. However, the program rapidly gained acceptance in the farming community, and by 2007 more than 70% of farmers had enrolled and tested their herds. In 2011 more than 95% of all SA dairy herds have enrolled in Dairy ManajD.

As expected, more than 70% of SA dairies have a Tested Negative (Score 7) status; many infected farms eradicated BJD on farm through a rigorous test & cull program, and advanced their Dairy Assurance Score accordingly.

The high level of enrolment was due to a number of factors:

1. New SA government policy required that from 2005 all dairy farmers were required to declare the Dairy Assurance Score of cattle born on a dairy farm, so farmers reasonably preferred to declare a higher score (from testing) than a lower one. PIRSA inspectors monitor compliance with this requirement and assist in extension messages.

2. Testing and veterinary costs were heavily subsidised for enrolled farmers. On larger farms PIRSA provided labour to assist in testing. This built a strong and positive relationship between farmers, vets and PIRSA.

3. All sectors of the industry supported the program, and said so at public forums.

4. The program was seen as fair and non discriminatory.

5. Infected farmers were assisted to improve their dairy score and in many cases eradicate BJD.
6. Although there was some resistance to altering calf rearing procedures by some farmers, most found that it was not difficult to achieve.

7. Dairy processor auditors visiting all SA dairy properties annually strongly supported the program and were often able to assist with questions by producers.

8. The program built a stronger and enduring relationship between farmers and veterinarians. Vets were “on the farm” more often, discussing BJD.

9. The new approach to BJD management in SA removed the stigma, and shame that farmers had felt with the prospect of being an “infected” farm. The use of a valid Dairy Assurance Score based on herd testing became an objective rather than subjective means of describing status and risk.

10. The availability and knowledge of the Dairy Assurance Score in SA (due to the mandatory requirement to declare) allowed producers to assess the risk, and protect themselves from the risk of introduction of BJD.

LESSONS LEARNED

In SA Johne’s Disease should be regarded as a community problem, rather than a disease that causes significant mortality or morbidity on infected properties. Consequently, a community and personal approach to the Dairy ManajD program was a key to success.

Other factors that enabled the rapid and almost complete uptake of the voluntary program included:

- Substantial funding for producers to test and maintain herds in the program
- A small and clearly defined dairy industry, with assumed low prevalence of infected herds
- Uniform and complete support from all sections of Industry
- Mandatory requirements to declare a Dairy Score when selling cattle, and monitoring of this
- Success in eradicating BJD from some infected properties, and funding for this
- A flexible and compassionate approach from PIRSA that could be adapted to suit individual needs
- Employment of a high profile retired dairy veterinary practitioner, who visited all farmers who had not enrolled in Dairy ManajD during 2006, 2007. This boosted enrolment.
IMPROVEMENTS

In view of the early success of the Dairy ManaJD program SACAG agreed to continue funding the program from 2007 until 2012, but at a decreasing level. From 2009 onwards farmers have been increasingly required to accept more of the costs of maintaining their Dairy Assurance Score. This has occurred in a stepped process, and the program simplified as well to be less costly to maintain.

The majority of Dairy Score 7 (tested and maintained negative herds) herds continue to maintain their status at a minimal cost, as they perceive a market advantage to doing this.

A new approved Herd environmental culture (HEC) test has enabled the use of a cheaper, quicker and less stressful herd test to maintain Score 7 status.

The smaller budget now allocated to the Dairy ManaJD program is designed to support the majority of the industry status, which is tested negative herds (Score 7 and above), rather than the larger infected herds with significant risk factors for reinfection, although a small number of infected herds are still progressing in an eradication program.
### Dairy Cattle BJD Assurance Scores

<table>
<thead>
<tr>
<th>Score</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>CattleMAP MN3</td>
</tr>
<tr>
<td>9</td>
<td>CattleMAP MN2</td>
</tr>
<tr>
<td>8</td>
<td>CattleMAP MN1</td>
</tr>
<tr>
<td>7</td>
<td>Tested to MAP Standard or Tested 4YO or Check Tested.</td>
</tr>
<tr>
<td>6</td>
<td>Restricted Stage 2</td>
</tr>
<tr>
<td>5</td>
<td>Restricted Stage 1</td>
</tr>
<tr>
<td>4</td>
<td>Tested Low Prevalence (&lt;2%)</td>
</tr>
<tr>
<td></td>
<td><strong>Non-Assessed</strong></td>
</tr>
<tr>
<td>3</td>
<td>Tested Moderate Prevalence (2 to 4%)</td>
</tr>
<tr>
<td>2</td>
<td>Tested High Prevalence (&gt;4%)</td>
</tr>
<tr>
<td>1</td>
<td>Infected or Suspect</td>
</tr>
<tr>
<td>0</td>
<td>Non-Assessed (after 2008).</td>
</tr>
</tbody>
</table>

---

**Certificate Number** S109

**SA Dairy ManaJD**

**Herd Status Certificate**

I certify that the Cattle Herd owned by

x

at

Y, SA

and which has been allocated the Registered Tail Tag Number SA42xxxxx

has satisfied the testing criteria and continues to meet the management standard required by the program.

A Herd Status of Dairy Score 7

1 Calf Credit Point awarded was assigned on 4/10/2005 (Date on which Herd achieved this Status)
NSW Approach to Managing BJD in the Dairy and Beef Industries

Sally Spence
Animal Biosecurity Unit, Department of Primary Industries, Orange, NSW, Australia

INTRODUCTION

Bovine Johne’s disease (BJD) is considered to be endemic within the NSW dairy industry with approximately 10% of dairy herds infected. In contrast there is a very low prevalence of BJD in the NSW beef industry where only 0.04% of herds are considered to be infected. The within-herd prevalence is generally very low regardless of industry with most infected herds having less than 1% of animals showing clinical signs each year.

BJD was a fully regulated disease within NSW and cattle producers were unhappy about the restrictions imposed to control the disease and were seeking to have a more risk-based approach introduced while still limiting spread of disease. After extensive industry consultation a new approach was implemented in 2008.

AIMS

The approach implemented in 2008 aimed to address the goals of the National BJD Program which are:

1. Reduce contamination of farms and farm products by Mycobacterium paratuberculosis
2. Protect the status of non-infected herds and regions
3. Reduce the social, economic and trade impacts of BJD at herd, regional and national levels.

MANAGEMENT APPROACH

A combination of extension, regulation, administration and incentives are used to influence cattle producer behaviour to manage BJD in NSW. Different strategies are used for the dairy and beef sectors.

The strategies endeavour to empower individual producers to meet the aims of the control program.

Assurance tools:

A variety of assurance tools have been developed in Australia and are used in NSW to assist farmers reduce the risk of introducing Mycobacterium paratuberculosis into their herds. These tools include the Cattle Market Assurance Program (CattleMAP), Beef Only and the Dairy BJD
Assurance Score. Details of these tools are available on the Animal health Australia website, see http://www.animalhealthaustralia.com.au/programs/jd/jd_home.cfm

**Strategies used:**

**Extension**
An extension and advisory program was undertaken over approximately 8 months prior to the introduction of the new approach. Components of this program included:

- “Train the trainer” training for Government regulatory and advisory officers and Milk Processor advisory staff
- Sending an information package including a self-carboning book of Dairy BJD Assurance Score Declaration Forms to all registered dairy farmers
- Writing to all beef producers who had purchased cattle from dairy farms in the previous 12 months and advising them of the planned changes
- Issuing press releases to the rural press on the changes
- Contacting all saleyards to advise them of the changes and providing them with posters to display in the saleyards.

Extension messages focused on encouraging producers to only introduce cattle with a high assurance status and to implement improved calf rearing practices.

**Regulation**
The beef industry remains fully regulated with quarantines imposed on beef farms where BJD has been confirmed or is suspected.

Most regulation has been removed from the dairy industry and no dairy farms are quarantined for BJD. The remaining regulations in the dairy industry are:

- Mandatory requirement to provide a Dairy BJD Assurance Score Declaration Form to the person receiving the cattle whenever cattle are moved from a dairy farm
- Requirements when dairy cattle are sold through a saleyard to have the Dairy BJD Assurance Score (Dairy Score): available to potential purchasers; visible to purchasers and announced by the auctioneer prior to the sale
- A copy of the Dairy BJD Assurance Score Declaration Form must be provided to the purchaser within 14 days of the sale.
The aim of these requirements is to ensure that people receiving cattle from dairy farms have information about the level of risk that those cattle are infected with *Mycobacterium paratuberculosis*. They can then decide whether they want to receive those cattle or not.

**Administration**

A record is kept of all infected dairy herds and once a month the National Livestock Identification System (NLIS) database is interrogated to determine where cattle have moved from the infected dairy farms. Action occurs where the movement is to a destination other than an abattoir or a feedlot.

If the cattle moved to another dairy farm advice of the status of the introduced cattle is provided to the purchaser.

If the cattle have moved to a beef farm an investigation is carried out and a risk assessment undertaken. Where the movement is considered high risk the beef farm is quarantined and a plan implemented to resolve the risk. Once the risk is resolved the quarantine is removed.

**Incentives**

The beef industry, through Cattle Council of Australia (CCA) provides funding through a number of programs to encourage improved surveillance and control of BJD. The incentives that have been provided by CCA in NSW are:

- The Financial and Non-Financial Assistance Package to assist beef producers eliminate infection from their herds and so allow them to be released from quarantine
- Subsidy for herd tests in beef herds
- Subsidies for investigating scouring beef cattle
- Subsidy for herd tests in dairy herds to encourage NSW dairy producers to test their herds.

**On-farm audits of calf rearing**

Audits of on-farm calf rearing was planned as implementing calf rearing improves a herd’s Dairy Score. It was considered that audits would increase the credibility of the Dairy Score. This strategy has not been implemented to date.

**IMPACT OF CHANGES**

The changes implemented have continued to protect the beef industry from BJD while reducing restrictions on the dairy industry. The numbers of infected cattle herds by industry sector are presented in Figure 1.
<table>
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<th>Species</th>
<th>No. farms June 2008</th>
<th>No. IN herds June 2008</th>
<th>% IN herd 2008</th>
<th>No. farms June 2011</th>
<th>No. IN herds June 2011</th>
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**Figure 1 - *Mycobacterium paratuberculosis* infected cattle herds by industry in 2008 and 2011**

The number of dairy herds known to be infected with *Mycobacterium paratuberculosis* has increased. This is partly due to increased surveillance which has identified previously unidentified herds and partly due to the introduction of cattle from high risk areas into previously uninfected herds. Between 2008 and 2011 there has been a reduction in the number of dairy farms in NSW but little change in the number of cows being milked. A number of very large milking herds have been assembled in that time and several of these have become infected through the introduction of cattle with low Dairy Scores.

**LESSONS LEARNED**

The small size and good communication within the dairy industry resulted in a high level of understanding about Johne’s disease control in most areas of the dairy industry. A combination of extension messages, subsidies and buyer pressure resulted in 241 dairy farmers testing their herds during 2008/2009. Many dairy and beef farmers are reluctant to buy cattle from dairy herds that have not been tested and cannot give a high level of assurance and this is a powerful incentive for dairy farmers to test their herds.

For some dairy producers, cattle sales are not an important part of their business and there is no incentive to protect their herds from Johne’s disease. Some of these farmers have taken advantage of the discounted prices and purchased low assurance cattle and introduced the disease. Hence the overall number of positive herds has increased. However many of these farmers have implemented good calf rearing practices to try and minimise the spread of Johne’s disease within their herds.

Because of the very diverse nature of the enterprises and large number of farms it has proven difficult to educate beef producers about Johne’s disease and the importance of only purchasing high assurance cattle.
Johne’s disease control in Australia – what’s worked, and lessons learned

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INTRODUCTION

The National Johne’s Disease Control Program (NJDCP) in Australia commenced in 1995, led by the cattle industries. Prior to that time disease control programs for paratuberculosis were managed individually by each state, resulting in different control approaches and requirements for interstate trade.

The NJDCP was established to coordinate the approaches to Johne’s disease control between jurisdictions and between the sheep, dairy, beef, goat and alpaca industries. The program is funded by the affected industries with state governments providing technical advice and the necessary regulatory framework to support the program, for example recognising animal health statements and including Johne’s disease as a ‘notifiable’ disease. Following the establishment of the NJDCP, a number of sub-programs have followed for the sheep industries and the beef and dairy sectors. The cattle and sheep sub-programs have taken a risk based approach to disease control. They have identified strategies to help manage the risks to production and trade for each particular industry. The alpaca and goat industries have also implemented strategies to address industry risk and preserve the very low herd prevalence for Johne’s disease that exists in Australia for their industries.

DISCUSSION

Australia has relatively few of the highly significant diseases identified by the OIE and therefore has relatively few national animal disease control programs. Programs such as the national Brucellosis and Tuberculosis Eradication Campaign (BTEC) and the national eradication program for contagious bovine pleuropneumonia were established with eradication as the objective and ceased once they were successful.

The NJDCP is a national disease control program where eradication is not the objective and this has meant that long-term strategies have had to be developed and the risk of ‘campaign fatigue’ managed. The program has had to be continually refined within the changing animal health management environment.

The Australian NJDCP operates within the constraints associated with regional variation in disease, differing industry sectoral assessments of and responses to risk and varying state political
environments. The balance of this paper will describe how these constraints have shaped the program and been the catalyst for program initiatives and modification.

Regional disease distribution

Johne’s disease is unevenly distributed within the Australian landmass with the majority of infected herds and flocks located in south-eastern Australia. Where geographic distribution of a disease is uneven, the implementation of one strategy across all regions is unlikely to succeed, because of the different needs and priorities of stakeholders.

Regions of Australia where the disease is unknown or rare have taken a regulatory approach and impose movement requirements for cross border trade to reduce the risk of infected stock entering the region and eradicate any incursions when they occur. However, early experiences of Johne’s disease programs within the states demonstrated that a regulatory approach, involving quarantine and in some regions compulsory destocking, did not work in areas where the disease was endemic. Over time those regions that developed active control programs have made considerable gains on the disease.

The NJDCP has moved progressively towards an ‘outcomes approach’ where stakeholders agree the objectives of the relevant program, and then develop and implement regional or state policies to deliver on these objectives for the particular industry. The effectiveness of each customised approach is monitored through annual reporting against the program objectives.

Industry differences

As well as geographic variation in herd and flock prevalence, there is considerable variation in disease prevalence between the livestock industries in Australia. The dairy and sheep industries have the highest flock/ herd prevalence. This variation in prevalence, and the different means by which industries manage risk, has created a degree of tension within the NJDCP. Fortunately there is only limited movement of animals between different industry sectors and stakeholders in the NJDCP continue to work consistently to mitigate such risks. The one constant has been that all participating industries develop strategies that are risk based, technically sound and address the aims of the national program.

On this basis, each industry has developed ‘tools’ to enable producers to manage their own disease risks and strengthen the industry as a whole. The national program continues to evolve as the new tools are developed and introduced. The cattle industries are planning to use a compartmentalisation approach to the management of Johne’s disease in the future.

Role of governments

Australia has a federated system of government and the state jurisdictions have responsibility for animal disease control. In the current political climate, which encourages the application of a ‘public good, private benefit’ approach, the commitment of state departments to the national program is variable. Commitment is driven by diverse elements such as the level of producer
interest, government philosophical approach to its support to agriculture, and the availability of funding (public and industry). States where the disease is considered endemic have very different views to those where the disease is rare or unknown.

Similarly, state industry organisations may take quite varied positions on the management of Johne’s disease. In some instances these organisations may find national animal health policies unpalatable and so the priorities of local organisations may be inconsistent with the objectives of the national Johne’s disease program. At times this political environment can test the robustness of the program. Engagement with and communication of national program objectives at a local level are difficult and conflicting local agendas can lead to miscommunication at the local and regional level.

SO WHAT HAS WORKED?

The most effective animal disease control programs have occurred where the state departments and producer organisations have worked together to develop local programs consistent with the national objectives. This has been the experience with the NJDCP. Invariably, in these situations, there has been strong local leadership from industry. There are a range of tools available in each industry sector. The most effective programs appear to be those where industry has resourced and coordinated a number of support packages to encourage the use of the tools. For instance, in industries or regions where Johne’s disease is rare or unknown and is controlled through regulation, financial and/or advisory support for producers whose herds are identified as infected delivers a more speedy resolution of disease status and a return to unrestricted trading.

The introduction of BJD counsellors to facilitate discussions between local veterinarians, business advisers and the owner of an infected or suspect herd has been extremely effective in the beef sector in resolving disease status. This has been supported by a financial package which includes funding to remove high risk animals, testing and providing business advice.

Producer driven programs are more likely to develop effective local solutions and succeed, than programs imposed by centralised government or industry bodies. A customised approach to disease control is seen as a valid and reasonable position if the approach achieves or contributes to agreed national goals.

Producer initiated regional biosecurity plans for OJD, with robust business rules for active disease control including risk assessment of sheep entering the region, have been effective in some regions in maintaining a very low disease prevalence or reducing disease levels.

Although not specific to the management of Johne’s disease, demonstrating a long-term economic benefit from disease management establishes a sound basis for a national program and provides evidence from which stakeholders can justify the allocation of funds to a national program.
Data collection to monitor the effectiveness of individual and regional control programs and the performance of the national program has been an important activity and proven useful to validate the approaches taken by individual states.

LESSONS LEARNED

There are many factors that can reduce the success of the national program including:

- over estimating the level of understanding and interest in Johne’s disease control of many farmers and advisers have when there are competing issues to manage (such as difficult market environments)

- assuming that regional and local stakeholders will automatically support a program designed to deliver national benefits. At times a regional community may place local sectoral interests over the national benefit and can work against the national interest

- a misplaced reliance on ‘individual business risk’ alone to drive disease control, where short term business priorities, such as sourcing replacement stock, over-ride longer term biosecurity interests

- reliance on only a subset of disease control prevention tools rather than implementing a comprehensive range; for instance relying solely on vaccination for preventing spread among sheep flocks despite good evidence that the vaccine is not fully protective and a significant proportion of vaccinated sheep are still infectious.

The Industry Session at the Colloquium on Wednesday will expand on aspects of these lessons in several Australian livestock industries and regions.

SUMMARY

Johne’s disease remains a challenging disease requiring vision, commitment, a long timeline and a sustainable program to make measurable gains in its management. Despite these challenges some industries and industry sectors have been able to reduce regional and within-flock/herd prevalence.

Success is more likely when there is a high level of local commitment to a comprehensive disease prevention and control strategy. Achieving this will require more effective resourcing of communication based on a better understanding of what producers and their advisors know and think about Johne’s disease, the benefits to the industry as whole from effective disease management and what will effectively drive their active engagement in the national strategy.
Demonstrating freedom from MAP infection in Swedish cattle, what’s next?

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INTRODUCTION

*Mycobacterium avium* subsp *paratuberculosis* (MAP) infection has been included in the Swedish Epizootic legislation since 1952 stating that all clinical suspicions must be investigated and when infection is detected it shall be eradicated. This has been done with whole herd stamping out, cleaning and disinfection combined with an empty holding period of the infected premises.

After decades of no cases, MAP was detected in an imported beef cow in 1993. During the following years with several extensive surveillances including dairy as well as beef cattle, 53 infected herds were revealed (Sternberg et al 2007). All cases have been in beef cattle and all cases have been linked to imported cattle. A national chain of infection in the Limousine breed could be traced back to a cow imported in 1975 (Sternberg et al 2002).

In order to estimate the probability of freedom from MAP infection and also to estimate the sensitivity for each surveillance component a stochastic scenario-tree model was used for MAP in Swedish cattle (Frössling et al 2010, Martin et al 2007a, Martin et al 2007b). This type of model allows information from several different sources, e.g. random or non-random surveillance data as well as documentation of differences in risk, to contribute to the quantitative estimation of surveillance sensitivities and probability of disease. The results showed a high probability of a very low prevalence of MAP in Sweden (Frössling et al 2011, submitted manuscript).

AIMS AND OBJECTIVES

The aims of the Swedish surveillance is early detection and demonstrating disease freedom and also to gain international acceptance for freedom of MAP infection in Swedish animals.

LESSONS LEARNED AND IMPROVEMENTS MADE

The major risk of introduction in Sweden is via imported animals. This is clearly indicated by the fact that all detected Swedish cases have been linked to imported animals. Each imported animal poses a risk of introducing MAP because paratuberculosis is a frequently occurring disease in most other countries, and because the incubation period is long and there is no reliable method to detect MAP in an incubating animal. It is important to control this risk of introduction in a free country or a country with a low prevalence. As part of this control, two factors are of main importance. Firstly, the risk of introduction decreases if the number of
imported animals can be kept low. This is promoted by a voluntary surveillance program in beef cattle run by the Swedish Animal Health Service. All major breeding beef herds are affiliated to the program which does not allow imports, unless the herd of origin has reached equivalent status within the program. This reduces the total number of imports considerably, as breeding beef stock is a herd category where imports often are considered desirable. Furthermore, the Swedish Animal Health Service contacts all farmers that plan to import animals in person, providing information about risks and supplying recommendations on sampling in addition to the legislated requirements. Secondly, surveillance is performed aiming at early detection of MAP in this high risk category of animals.

The sensitivity of clinical surveillance of paratuberculosis is very low. In Sweden, MAP had probably been present at a low prevalence for twenty years, primarily in the Limousine breed, before it was detected. In the tracing regime that was carried out it was common to find just one or two subclinical animals in herds. The low number of clinical suspicions being investigated for paratuberculosis also indicates a poor performance of clinical surveillance. This is likely due to the non-specific kind of clinical signs in paratuberculosis and that, in a free country, veterinarians tend forget about the disease. Improvements of the clinical surveillance will be attempted this year by asking veterinarians visiting cattle herds, during a limited time period, to sample cows with clinical signs compatible with paratuberculosis. This will hopefully increase the number samples taken and analyzed and also increase the awareness of paratuberculosis among practicing veterinarians.

Fallen stock is considered a risk category as regards several diseases and increased sampling among these animals will be attempted in the future. One of the surveillance components for MAP in Sweden is sampling of all ruminants older than one year of age, submitted for necropsy. When collecting data for recent evaluation of the surveillance system, it was revealed that sampling was performed only in approximately half of these animals. The model was then used to investigate the effect of sampling all cattle older than one year, submitted for necropsy. This improved the sensitivity of this surveillance component but the overall sensitivity of this surveillance component remained low. The model is now being used to estimate the proportion of fallen stock that need to be sampled in order to achieve the required sensitivity of this surveillance component.

CONCLUSIONS

Stochastic scenario-tree modeling can be helpful not only to demonstrate freedom of disease, but also as a tool to support planning for, and estimating the efficiency of future surveillance activities.

The close and constructive cooperation in actions taken between Swedish authorities and the Swedish Animal Health Service is of vital importance in keeping Sweden free from MAP. This is particularly important when legislation does not allow the authorities to require sampling of imported animals or their herds of origin enough to exclude carriers of MAP.
REFERENCES


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